

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE J		PAGE OF PAGES 1 76	
2. AMENDMENT/MODIFICATION NO. 0004		3. EFFECTIVE DATE 18-Feb-2009		4. REQUISITION/PURCHASE REQ. NO. W26WKS81947589		5. PROJECT NO.(If applicable)	
6. ISSUED BY AFGHANISTAN ENGINEER DISTRICT US ARMY CORPS OF ENGINEERS KABUL APO AE 09356		CODE W917PM		7. ADMINISTERED BY (If other than item 6) See Item 6		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X		9A. AMENDMENT OF SOLICITATION NO. W917PM-09-R-0042	
				X		9B. DATED (SEE ITEM 11) 23-Jan-2009	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input checked="" type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) The purpose of this Amendment is to address questions submitted by contractors and to update sections 01010 Scope of Work (SOW), and section 01015 Tech Requirements. The proposal due date is extended to 26 February 2009, 1700 Hrs (5:00 PM), Kabul time. See the Summary of Changes page for details.							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				TEL: _____ EMAIL: _____			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
_____ (Signature of person authorized to sign)				BY _____ (Signature of Contracting Officer)		18-Feb-2009	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS

The following have been added by full text:

CONTRACTOR QUESTIONS**Questions from the Contractors****ANA Hospital Additions Mazar-e-Sharif, W917PM-09-R-0042**

- Question 1: What kind of perimeter is needed for the project (Fence, Wall, no boundary)?
- **Answer: Please read specifications 01010 – No wall is required**

- Question 2: Can we use the existing back up generator of the hospital for the new one or we should have new one?
- **Answer: Please see the amendment solicitation document. Read specifications 01010 section 4.8 & other paragraphs– The complete electrical requirements are listed. This is the design–build contract & the contractor must be able to determine utility and other requirements from the scope of work 01010.**

- Question 3: do we need room and fuel tank for new generators?
- **Answer: Again, this is a design-build contract; the contractor is responsible to make this determination.**

- Question 4: The hospital must be one Story building?
- **Answer: The hospital is shown as one story. The contractor may propose more than one story as part of his design but entirely at the risk of the contractor. The government may not accept such design variation of more than one story. That is the risk of the design-build contract.**

- Question 5: How many square meter area is the new hospital facility, DEFC, Generator, Parking, and Barracks?
- **Answer: We gave specifics (number of patient beds, diners for DFAC, etc.) in the specification 01010. Additionally we gave drawings with a scale. The contractor is to use this information for a design. We did not give the exact square meter as to allow the contractor some freedom in his design for the most efficient and cost saving design as possible.**

- Question 6: Do we need new well and water pump room or we can use the existing water system which comes to the existing hospital?
- **Answer: Please read specifications 01010 section 4.4 – contractor is to connect to existing water system.**

- Question 7: Do we need asphalt roads around building of gravel.
- **Answer: Please read specifications 01015 section 2.3.4.1 which requires paved roads. You must read the entire solicitation to be competitive for this contract.**

- Question 8: The new barracks are for the soldiers or for the patients?
- **Answer: Where does this question come from? There is nothing in this specification about barracks.**

- Question 9: do need ware house for the stock?
- **Answer: Again, there is nothing in the solicitation about this.**

- Question 10: All drawing measure not read able. I need all building square meter please. I read sow but not find metric size only wall and other one.
- **Answer: Contractor is responsible for determining the size of the building - we gave specific requirements (that is, number of patients, diners in DFAC) plus scaled drawings - that is all we give for Design-Build contract. The purpose of the design build is to allow the contractor freedom to design the most efficient facility.**

- Question 11: According to RFP the DFAC shall be full service. Chairs and tables of Dining Facility are in contract or No?
- **Answer: There is nothing in this solicitation about chairs & tables.**

- Question 12: Refrigerator is walk in or commercial?
- **Answer: Please read specifications section 01010, paragraph 4.1.3, (k) Procedure room:Equipment items include a plaster sink, cabinets, counters, ice machine, refrigerator & others. (p) Break room: lounge area for medical staff to include a counter with sink and overhead cabinets and a refrigerator. & 4.1.5, (W) The contractor shall provide space and electrical outlets for future installation of refrigerators/freezers.**

- Question 13: Tables and shelve for food processing is in contract or No?
- **Answer: Provide equipment as described in sections 01010, 01015 or as shown on the drawings in Appendix A.**

- Question 14: Office Area - Lockers are in Contract or No?
- **Answer: Lockers & locker rooms are required where specified.**

- Question 15: Hospital - Patient beds are in Contract or No?
- **Answer: Providing patient beds are not part of this contract.**

- Question 16: Is the existing water storage tank enough for fire sprinkler system or contractor shall be construct extra tank for fire system?
- **Answer: Please read specifications section 01015; paragraph 8.6 Water Supply for Fire Protection: Fire sprinkler is required. The existing water supply source is to be used for the water supply for the sprinkler system.**

- Question 17: Is the existing pump house and pumps enough (Capacity and Pressure) for fire sprinkler system or contractor shall be construct extra pump house for fire system?
- **Answer: According to the requirements in sections 01010 and 01015 the contractor shall prepare the calculations and design for, and shall provide and test, a fully functioning fire protection system.**

- Question 18: Is it needed to supply and install diesel generator fire pump or no?
- **Answer: According to the requirements in Sections 01010 and 01015 the contractor shall prepare the calculation and design for, and shall provide and test, a fully functioning fire protection system.**

- Question 19: Please notify the place of the second drawing on the site plan.

- **Answer: The second drawing in appendix A (enlarge floor plan) is the revised plan for the area marked in bubble. The second drawing in enlarged/revised bubble area of the first drawing.**
- Question 20: Contractors Received Higher resolution Drawing ANA Hospitals Mazar-e-Sharif, but the Size not Clear in Details of the Drawing. Could send one same thing with Details in AED Web Pages?
- **Answer: Contractor is responsible for determining the size of the building - we gave specific requirements (that is, number of patients, diners in DFAC) plus scaled drawings - that is all we give for Design-Build contract. The purpose of the design build is to allow the contractor freedom to design the most efficient facility.**
- Question 21: In the Scope of work it was mentioned that this hospital is of 46 beds but in the site visit we have been told that it's of 60 beds so which one is correct.
- **Answer: Please follow the solicitation.**
- Question 22: Could you please specify the exact dimensions of the hospital building?
- **Answer: Answer: Contractor is responsible for determining the size of the building - we gave specific requirements (that is, number of patients, diners in DFAC) plus scaled drawings - that is all we give for Design-Build contract. The purpose of the design build is to allow the contractor freedom to design the most efficient facility.**
- Question 23: What is the standard for the construction of this hospital and according to what standard code do you want us to do this job.
- **Answer: Please refer to solicitation section 01015 Technical Requirements**
- Question 24: In the synopsis the construction includes hospital building, Dining Facility and Administration Area so we are curious that is that all included in this project, just to clarify.
- **Answer: Please read solicitation section 01010 Scope of Work – Design Build for Hospital Addition**
- Question 25: In the scope of work section 4.3, Demolition and grading, it's written that "the contractor shall demolish all existing structures..." but in Appendix A, site plan, no existing structures appear in the area of the new proposed hospital. If exist, how many buildings must be demolished and where is their locations on the site?
- **Answer: There is no building to be demolished, if there are minor structures the contractor will need to demolish them.**
- Question 26: in the scope of work section 4.14 Road Network, Sidewalk and Parking. it's written "Provide parking areas for vehicles for the following facilities inside the compound." in Appendix A , site plan drawing, it appears a parking lot near the new provided hospital, is it an existing parking or to be provided? If to be provided we need the number of vehicles or the parking area to be constructed.
- **Answer: Please see the amendment solicitation document (sections 01010, paragraph 4.13).**
- Question 27: is the building a pre-engineered metal building system with exterior CMU wall or a steel structure roof supported by bearing CMU wall.
- **Answer: This is the design build contract. There is a chance the facility could be pre-engineered; more likely a combination of a pre-engineered frame with CMU infill or any other structure mentioned in your question.**
- Question 28: does the power plant exist? How far is the power plant from new hospital?
- **Answer: Please see the amended solicitation documents.**

- Question 29: what is the preliminary load of the site?
- **Answer: Please see the amendment solicitation documents.**

- Question 30: Do the spare generators exist?
- **Answer: Please see the amendment solicitation documents.**

The following have been modified:

SECTION 01010 - SOW

SECTION 01010

SCOPE OF WORK – DESIGN BUILD FOR HOSPITAL ADDITION

1.0 GENERAL

The project consists of the design and construction of a new Hospital Addition at the ANA Garrison at Mezar E Sharif, Afghanistan. The addition is one facility that consists of the following distinct functions

- (1) Hospital patient sleeping room facility for 46 bed patients
- (2) Administrative area for medical staff offices
- (3) Full service dining facility (DFAC) with kitchen and dining area with seating for 60 dining patrons.

A concept plan is shown on Appendix A (five drawings). One drawing consists of the hospital addition plan, The second concept plan drawing consist of the DFAC, toilet/lockers room area and admin offices. The third drawing is a site plan of the area noting the hospital addition, the fourth drawing consists of a sketch of the floor trench, the fifth drawing is as built drawing for the existing hospital. The project is defined as the design, material, labor, and equipment to construct building, parking, utilities and other infrastructure. The work within this contract shall meet and be constructed in accordance with current U.S. design and International Building Codes (IBC), Life Safety Codes (NFPA-101), Force Protection and security standards. A partial listing of references is (see specifications 01015 for a full listing of code and other references):

IBC, International Building Codes 2006

NFPA 101, Life Safety Code

UFC 4-010-01, DoD Minimum Anti-Terrorism Standards for Buildings.

1.1 ENGLISH LANGUAGE REQUIREMENT

All documents prepared, and all conversations conducted, pursuant to work to be performed by the Contractor under the provisions of this task order shall be in the English language. The contractor shall have a minimum of one English speaking representative on-site at all times when work is in progress. The Contractor's on-site representative shall be capable of effective communications, both orally and in writing, with the Contractor Officer and his/her authorize representatives. If any document written pursuant to the requirements of this contract is in the English language, and any other language, only the English language version shall be official.

1.2 SUBMITTALS

Submittals and a Submittal Register are required as specified in Section 01335 of the Basic Contract.

1.3 CQM TRAINING REQUIREMENT

Before project design and construction begin, the Contractor's Quality Control Manager is required to have completed the U.S. Army Corps of Engineers CQM course, or equivalent. Courses are offered at regular intervals. For enrollment and course information, contact Reed B. Freeman at the following:

Reed B. Freeman, PhD, PE
Quality Assurance Branch
Afghanistan Engineer District, USACE
Email: reed.b.freeman@usace.army.mil
Telephone: 079-760-4396

A copy of the course completion certificate shall be included in the Design Analysis submittal.

USACE Guide Specification 01451, entitled "Contractor Quality Control", 3.5.D. requires approval of the Contractor's CQC Plan. That approval is contingent upon the successful completion of this course by the Contractor's Quality Control Manager.

1.5 ELECTRICAL WORKERS QUALIFICATIONS

Electrical work shall be performed by Qualified Personnel with verifiable credentials who are thoroughly knowledgeable with applicable code requirements. Verifiable credentials consist of a certificate of graduations from an approved trade school and required amount of experience, depending on work being performed, and should be identified in the proposal that is submitted. Qualified personnel is one who has received training in and has demonstrated skills and knowledge in the construction and operation of electrical equipment and installations and the hazards involved. This includes the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, to determine the nominal voltage of exposed live parts, the clearance distances and corresponding voltages to which the qualified person will be exposed.

1.5.1 Supervisory Electrician

Supervisory electricians must be graduates of an approved trade school, and must have two years of relevant electrician experience. Approved programs include but are not limited to the Afghanistan Technical and Vocational Institute (in Kabul), the Kunar Trades Training Center, and the Commercial Technical Training Center (in Jalalabad). Work experience resumes and graduation certificates shall be submitted and approved prior to commencement of any design or construction involving electrical work. Approval is granted by the Contracting Officer's Representative with guidance by the Quality Assurance Branch and/or the Safety Office of the Afghanistan Engineer District, US of the Army Corps of Engineers.

1.5.2 Electricians

Electricians must be graduates of an approved trade school and must be able to provide upon request a certification of successful course work completion and graduation in addition to a resume of work experience.

1.6 ENVIRONMENTAL CONSIDERATIONS

The scope of work, associated specifications and the construction/operations of the facilities identified in this contract do not create any obligations, commitments, or requirements on the part of the US Government beyond those obligations, commitments or requirements already in-force based upon existing bi-lateral or multilateral treaties, agreements and or understanding concerning the protection of the environment.

2.0 LOCATION

The site is located at the existing hospital facility at the ANA Garrison in Mazar-e-Sharif, Afghanistan, as shown on the attached site plan.

3.0 UNEXPLODED ORDNANCE (UXO)

3.1 UXO REMOVAL AND CLEARANCE

The contractor is not responsible for the clearance or removal of mines and unexploded ordnance (UXO) from the site prior to the commencement of construction.

It is the responsibility of the Contractor to be aware of the risk of encountering UXO or mines and to take all actions necessary to assure a safe work area to perform the requirements of this contract. The Contractor assumes the risk of any and all personal injury, property damage or other liability arising out of or resulting from any Contractor action taken hereunder. The Contractor and its subcontractors may not handle, work with, move, transport, render safe, or disarm any UXO or mine, unless they have appropriate accreditations from MAC.

If a UXO or mine is encountered during project construction, UXO or mine disposal shall be handled in accordance with Section 01015, Technical Requirements.

4.0 SUMMARY OF WORK

4.1 CONTRACTOR REQUIREMENTS

The contractor shall design and construct the facilities as a design-construct contract and shall be in accordance with the requirements stated in Section 01015: Technical Requirements. Refer to attachment following this section for more specifics for required spaces. Design and construction work shall include but not be limited to that shown within attached tables and described below.

4.1.1 GENERAL REQUIREMENTS FOR FACILITIES

All requirements set forth in the Scope of Work, but not included in the Technical Requirements, shall be considered as set forth in both, and vice versa. Provide heating, ventilation and air conditioning (HVAC) for all facilities unless otherwise stated in sections 01010 or 01015. All toilets shall be western -style.

All standard construction amenities and details such as HVAC, lighting, site drainage, utility connections, etc. shall be implied as a design and construction requirement. Drawings referenced are contained in Appendix A. Concrete walkways are required to connect all buildings, facilities, and features such as parking lots, etc.

Design and Construct circulation pathways and exit stairs in accordance with building code references herein. Automatic fire sprinkler system is required. The facility shall comply with all other safety requirements as required within references. Smoke detectors and fire alarm systems shall be installed in accordance with requirements herein.

The design and construction work shall include but not be limited to the following sub-paragraphs.

In general, this project consists of design and construction of the following:

4.1.2 HOSPITAL ADDITION

This project consists of a single story hospital addition to connect to an existing hospital at the existing ANA Garrison. The addition shall access the existing hospital via an enclosed corridor. The addition shall provide patient care areas for 51 total patients, along with related administrative and support capabilities. The hospital addition is one facility (see appendix A for a concept drawing, detailing required spaces and sizes; note this drawing is for guidance only, the contractor may make alterations as required) composed of three distinct areas. The hospital area consists of non-ambulatory patient rooms and related areas. The admin area consists of office spaces. The DFAC area is a full service dining facility sized for the occupants of the facility. See the attached concept design drawings in Appendix A (note the DFAC, toilet and admin areas have a separate drawing). For fire protection considerations, the facility consists of three distinct occupancies (1) non-ambulatory healthcare (2) business (3) assembly and the contractor must design and construct per the applicable codes in relation to these occupancies. The three areas are described in detail in the following:

4.1.3 Hospital Area

- (a) Patient Rooms. Provide open area rooms for 46 beds for patients to recover from surgery or other treatments. Provide 10 dual electrical outlets equally spaced along the walls for this room. Electrical circuits will support not more than 4 electrical outlets in this room. Each patient room will have at least one shower and toilet room. All patient rooms shall have direct access to windows for natural lighting (window height must be 915 mm AFF for smoke exhaust purposes). Install curtains between patient beds for privacy. All doors must be at least 1055 mm in width for surgical bed traffic. Include an oxygen system to be tied in with existing bed system as well.
- (b) Isolation Rooms: provide two separate bedrooms for infectious patients, to include a separate ventilation for the purpose of infection control. An attached visitor-patient room is required to provide visitations in an infection controlled environment.
- (c) Waiting room: a waiting room, minimum size to contain 40 visitors, located adjacent to the nurse counter to provide nurse supervision. The waiting room must have an exterior exit door and be enclosed from the corridor. The area will contain one each male and female toilet, a gift shop and a vending area. The corridor walls and doors shall contain glazing.
- (d) Pharmacy: provide a pharmacy room for the storage of drugs and medications. The room must be secure; with fully reinforced and grouted CMU walls and a security rated door with a cipher lock. A service window with a counter at 1100 mm AFF is required; the opening shall not exceed 0.035 SM.
- (e) Laundry facilities: to include soiled and clean linen rooms and a full service laundry facility, to include commercial grade washers and dryers with an exterior door with ramp for deliveries. The soiled linen and laundry rooms require one hour fire rated walls with 45 minute rated doors. All 3 areas shall be co-located.
- (f) Storage rooms: storage rooms are included and all require a one hour fire rated wall with 45 minute rated doors.

- (g) Corridors: access to all rooms shall be provided by corridors, minimum clear width is 2440 mm. Provide vestibules at all exits. Patient railings and bumper guards are required. The corridor does not require a fire rating but does require smoke tightness, to include the ceiling.
- (h) Barber shop: provide a barber shop, with two barber chairs and accompanying sinks, counter, mirrors and related items.
- (i) VIP visitor room: shall contain beds for VIP visitors.
- (j) Nurse station: full service nurse station with two-sided counter for nurse work station and reception side for patient care. Mirrors shall be provided on adjacent corridors for full viewing of the patient sleeping rooms. Counter shall contain a security grille.
- (k) Procedure room: located adjacent to the nurse station, its function is to provide assistance for nurses in performance of their medical duties. Equipment items include a plaster sink, cabinets, counters, ice machine, refrigerator and others.
- (l) Supply rooms: provide medical and administrative supply rooms.
- (m) Reception counter: similar to the nurse station, a counter located directly opposite the waiting area with the function to check-in visitors. Requires a two-sided work counter with reception side with a security grille.
- (n) Nurse study: library and study room for medical staff.
- (o) Nurse office: administration space for nurses.
- (p) Break room: lounge area for medical staff to include a counter with sink and overhead cabinets and a refrigerator. Outlets shall have capacity for food preparing appliances (microwave and coffee machine).
- (q) Conference room: room used for staff meetings.
- (r) Locker rooms: one for each sex, with upright lockers for changing of medical uniforms.
- (s) Janitor spaces: large janitor room and office required for hospital cleaning duties
- (t) Toilet/shower/locker spaces: sized for medical staff. Visitors have their own toilet areas.
- (u) Facility office: office space for the facility manager.
- (v) Building support areas: include mechanical, electrical and telephone rooms. The addition floor level shall be constructed at the same elevation as the floor level of the existing hospital to avoid any steps or includes between the new spaces and the existing spaces.

4.1.4 Administrative Offices: required for hospital professional medical staff usage.

- (a) office spaces: general office rooms for one person, as many along exterior walls as possible.
- (b) shared office spaces: shared general office spaces (two) each
- (c) communications and storage rooms
- (d) corridors: clear width of 1800 mm required; requires one hour fire rating with 20 minute doors.

4.1.5 Dining Facility (DFAC)

The Contractor shall design and construct a Dining Facility (DFAC) suitable for serving 60 personnel at one seating within the hospital addition. This area shall provide cafeteria-style feeding of short order and regular style meals. Spaces include dining areas and kitchen facilities outfitted with built-in liquid propane-burning stoves installed in accordance with manufacturer's instructions. The Contractor shall incorporate the following special features into the DFAC:

- (a) The kitchen shall be physically separated from the rest of the dining facility with a 2-hour fire rated wall with 90 minute rated doors. At openings for serving line and dirty dish return provide 90 minute fire rated shutters. No glazing is permitted.
- (b) The backsplash and front and side surfaces of stove enclosures shall be terrazzo with heat resistant grout. The top of the stove enclosure shall be finished concrete. Edges will be covered by a metal "L" angle to prevent damaging edges during pot movement.
- (c) The height of the stove from the floor to the burners shall be 50cm

- (d) The floor in front of the row of burner enclosures shall be slightly sloped towards the floor drain to direct water overflowing from pots or spigots near the pots away from the work area in front of the stove enclosures.
- (e) New propane stoves* shall be installed with consideration to ease of cooking operation and daily cleanup. They should be located on an exterior wall side for ease of ventilation. New stoves shall be set into a formed concrete openings such that they can easily be removed for replacement, maintenance and cleaning. Stove dimensions are 72 cm long x 72 cm wide x 50 cm high. Height includes the grill. Desired stove to stove clearance is 72 cm.

* Would prefer that the propane stoves be located at the external wall. Currently shown at the internal wall

- (f) Each propane stove shall be provided with three burners. The propane stoves shall be of commercial quality and be capable of producing the highest BTU heat output with all three burners on. The center burner is low heat, center and middle burner is medium heat and all three burners is high heat. A shut off valve for each burner shall be provided at the face of the propane appliance.
- (g) Propane storage tanks shall be provided and installed in accordance with NFPA 58. Their propane storage tanks shall be installed on a concrete pad, and placed within an covered, secure enclosure to protect tanks from the elements. Provide an access gate for removal and replacement of propane tanks. The access gate shall able to be secured and locked. Propane tanks shall be secured such that none move or topple over.
- (h) The Contractor shall coordinate with the DFAC staff and Contracting officer in determining amount of propane fuel required daily for the DFAC. The propane fuel requirement shall be calculated based on consumption of fuel every cooking cycle, cooking frequency, and required "surge" capacity. The Contractor shall provide an agreed to amount of fuel tanks filled with propane fuel at time of project completion.
- (i) Piping from propane tanks to their respective propane stoves shall be of wrought iron, ASTM B36.10M or steel (black or galvanized), ASTM A53. The steel piping shall terminate in front of the propane stoves with a shut off valve and quick disconnect nipple. A stainless steel flexible hose (Gastite or equal) shall connect the propane stove to the steel piping per NFPA 58 section 5.8.6. Each end of the flexible hose shall be provided with quick disconnect dielectric fittings.
- (j) Propane supply piping shall be installed in concrete trenches. Piping may also be surface mounted provided it is not susceptible to damage, or causes any safety hazards.
- (k) Piping passing through the exterior wall shall be provided with pipe sleeves.
- (l) Ventilation hoods
- Hoods shall be designed to capture and confine cooking odors, vapors, and residues.
 - Hood exhaust rate shall be 400 cubic feet per minute per linear foot (CFM/ft) (620 L/s per m) of open hood.
 - Hoods shall be constructed of 20 gauge stainless steel.
 - Hoods shall be provided with a side panel at each end to close in the area between the stove and the hood. Side panels shall be the width of the hood and shall extend to the rear wall at 45 degrees. Approximate dimensions are 37 inches by 37 inches by 45 degrees (925mm by 925mm by 45 degrees). If a non-combustible wall abuts a stove, then a side panel shall not be required on that side of the hood.
 - Joints, seams and penetrations shall be externally welded or brazed to form a watertight seal with a smooth surface that is readily cleanable.
 - All surfaces shall be designed to be easily and thoroughly cleanable.
 - Hoods shall be securely supported with non-combustible materials.

- Hoods shall extend a minimum of 9 inches (225mm) beyond the front edge of the stove and shall be installed a maximum of 4 feet (1200mm) above the surface of the stove.
- Hoods shall be sealed to the rear wall.
- The center hood of each bank of fans shall have one electrical switch on the front face to operate the exhaust and make-up air fans.
- Grease filters will not be required. Hoods shall be constructed so that grease filters can be installed at a later date.

(m) Ductwork

- Ductwork shall be protected against corrosion.
- Ducts shall be constructed of 18 gauge stainless steel.
- Supply and exhaust systems for each hood shall be independent of other duct systems.
- Joints and seams shall be continuously welded or brazed.
- Bracing and supports shall be constructed of non-combustible material securely fastened to the structure. Bolts, screws, rivets, and other fasteners shall not penetrate the duct walls.
- Airflow in the ductwork shall be not less than 500 feet per minute (150m/min).
- Ducts shall be placed a minimum of 18 inches (450mm) from combustible material or 3 inches (75mm) from gypsum wallboard attached to non-combustible structures.
- Ductwork terminating through the roof shall extend a minimum of 18 inches (450mm) above the roof.
- Where roof terminations are not possible, ducts may be terminated through an exterior wall. All ductwork terminating through an exterior wall shall be located a minimum of 3 feet (900mm) from exterior openings. Ductwork shall be pitched to drain back to hood.
- All ductwork terminations shall be a minimum of 10 feet (3000mm) horizontally from other buildings and property lines.

(n) Exhaust Fans

- Exhaust fan motor shall be located outside the airstream.
- Fan discharge shall not impinge on the roof, other equipment or appliances, or parts of the building.
- Discharge outlet of exhaust fans shall be a minimum of 40 inches (1000mm) above the roof.
- Up-blast fans shall be hinged and supplied with a flexible weatherproof electrical cable to permit inspection and cleaning.
- Connection between ductwork and exhaust fan shall be flanged, gasketed, and bolted.
- Each exhaust fan shall be electrically interlocked with its corresponding make-up air fan to prevent system operation without both fans in service.

(o) Make-up Air Fans

- Make-up air inlet locations shall take into consideration the prevailing wind direction and shall be placed upstream of exhaust outlets.
- Wherever possible, make-up air inlets shall be located a minimum of 10 ft (3m) from exhaust outlets.
- Where make-up air inlets are located within 10 ft (3m) of an exhaust outlet, the make-up air inlet shall be located a minimum of 3 ft (0.92m) below the exhaust outlet.
- Each make-up air fan shall supply a maximum of 110 CFM/ft (170 L/s per m) of perforated diffuser.
- Each make-up air fan shall be electrically interlocked with its corresponding exhaust fan to prevent system operation without both fans in service.

(p) Testing

- A performance test shall be conducted upon completion and before final acceptance of the system installation.
 - The test shall verify the rate of exhaust and make-up air flow.
 - The test shall be witnessed by the COR.
- (q) Install a canopy over the exterior area adjacent to the stoves to provide an area protected from the weather for storing propane tanks for stoves. The canopy shall be sized to cover the area adjacent to all of the stoves. Refer to the NFPA 58 for guidance on fuel tank storage.
- (r) Floor drains shall be incorporated into the dining area with the floor sloped to drain. .
- (s) Trench type floor drains shall be installed in the kitchen cooking and dishwashing areas. The drains shall be connected to an outside grease trap. See Appendix A for a sketch of the floor trench.
- (t) Hand wash stations in the entry vestibule shall be provided. Trough type sinks shall be used.
- (u) Install several large wash basins with a low rim height designed for washing very large pots.
- (v) Run water lines to and install wall mounted spigots next to each cooking station in order to permit pots to be filled during cooking without having to move them.
- (w) The Contractor shall provide space and electrical outlets for future installation of refrigerators/freezers
- (x) Fire protection is to be provided by fire extinguishers throughout the facility at easily accessible locations. This facility will have fire sprinkler protection. See NFPA 96 for specialized fire protection of the gas stove area.
- (y) The Contractor shall design and construct a chain-link fenced storage yard for food and install facilities for the storage of both dry goods and refrigerated items.
- (aa) Latrines: one unisex for kitchen staff.
- (bb) Janitor with Mop sink
- (cc) Office: requires window to view kitchen operations
- (dd) Dining area: sized for 60 patrons, with two exits (require panic hardware), floor drains required, collocated with the entrance hand washing stations.
- (ee) Dish washing area (scullery): located near soiled dish return.
- (ff) Food preparation area: located near stove and storage areas
- (gg) Serving area: requires serving counter and opening in the wall between the dining and kitchen areas.
- (hh) Dry storage area: located at delivery entrance

4.1.6 General Facility Requirements:

Refer to the Civil, Site, Architectural, Structural, Mechanical, and Electrical work and requirements listed in Section 01015 to design and construct the hospital addition. The structure shall include all internal electrical, mechanical, plumbing and telecommunications systems. Connections of new utilities to existing utilities shall be reviewed and approved by the Contracting Officer. Include fire suppression system. Ceilings shall be suspended type with painted GWB surface. Ceiling heights AFF are as follows: patient

rooms – 3000 mm, corridors- 2400 mm, waiting area – 3000 mm, DFAC – 3000 mm, toilets – 2600 mm, offices – 2600 mm, storage and utility rooms – per contractor design, admin spaces – 2600 mm, laundry and barber areas – 2600 mm. Fire rated walls must extend to the roof structure and be continuous.

4.2 SITE PLANNING

The Contractor shall prepare a site boundary survey and site plan for each site based on information contained in the Request for Proposal. Contractor shall verify all space requirements and code compliance in accordance with sections 01010 and 01015 of this contract.

4.3 DEMOLITION AND GRADING

The contractor shall demolish all existing structures at each site prior to commencement of new work. The Contractor shall remove and dispose of all debris, concrete, and foundations and any other remains of the existing structure. The Contractor shall choose and propose a location for disposal resulting from demolition for approval by the Contracting Officer. The Contractor shall perform complete final site grading after installation of all required drainage structures per the Drainage Plan that shall be prepared as part of these projects and after installation of any other buried utilities or other project components.

4.4 WATER SYSTEM

The contractor shall connect to the existing potable water supply (PWS) system at the Garrison. Contractor is to provide a separate building connection to the existing water supply for the Mazar-e-Sharif hospital addition. The PWS shall be constructed to deliver a minimum 345-414 kPa (50-60 psi) at a flow rate that is twice the required daily demand.

4.5 SANITARY SEWER & TREATMENT SYSTEM

The sanitary sewer collection shall be designed and constructed by the Contractor. The sanitary sewer collection system shall consist of gravity sewer pipe network and accessories such as manholes, cleanouts, grease interceptors, and building service connections.

The sanitary sewer system shall be designed to accommodate the total facility compound population as specified in the Scope of Work and verified by the contractor, *plus 25%. DFAC kitchen follows shall be based on the number of meal served per day.*

System capacity shall be calculated based on a hydraulic waste load equivalent to 80 percent of the water usage rate of 190L per capita day, or 152L per capita day.

The gravity sewer collection system shall connect to the installation wastewater treatment facilities.

4.6 HVAC SYSTEM

The entire addition (except for the kitchen) shall be provided with heating and cooling. Heating and cooling to the respective spaces shall be provided using a ducted, forced air system. Packaged split pack heat pump units are not acceptable. Each occupied space shall be provided the air quality as defined in ASHRAE 62.1.

Adequate ventilation shall be provided for the kitchen using range hoods or exhaust fans. Makeup air for the range hoods shall be of the compensating type (integral with the range hood) and from conditioned air drawn in from the adjacent area.

4.7 PLUMBING SYSTEM

Provide complete plumbing system for the addition IAW IPC.

4.8 ELECTRICAL SYSTEM

The existing hospital is supplied from two different power sources. Both power sources terminate at a manual selection switch that is connected to the sole transformer supplying the building. There are two backup generators to supply power to the emergency bus in the event of a power outage. The contractor shall reconfigure the existing configuration to comply with the requirements UFC 4-510-01 for a double ended substation. The contractor shall also upgrade the backup generators to supply power to the emergency circuits in the existing facility and the addition. All electrical distribution shall be underground in direct buried, thick walled schedule 80, conduit. All electrical design and installation shall meet NEC (NFPA 70) requirements. Conductors and circuits shall be sized for the specific loads. Secondary voltage shall be 380/220 VAC, 50 hertz. For details of the electrical power system see Section 01015: TECHNICAL REQUIREMENTS.

The reconfigured power supply system shall form a new double-ended substation to power the existing hospital, and addition. The substation shall consist of a minimum of two transformers, surge suppression, medium voltage switchgear, and low voltage switchgear/distribution panel. It shall be backed up with two generators, fuel storage and UPS. Substation shall be designed in accordance with sections 10.2 and 10.3 (including figure 10.1) of UFC 4-510-01 or in accordance with Annex B (Multi-Ended Network Substation, including figures 10.5 & 10.6) of UFC 4-510-01. The contractor shall design redundant capacity in accordance with the requirements of UFC 4-510-01. Substation shall be built in compliance with NEC, NESC, UFC 3-550-03FA (Design: Electrical Power Supply & Distribution), and UFC 4-510-01 (Design: Military Medical Facilities). Substation shall be a double-ended or multi-ended network. Double-ended is defined by IEEE 241 (Electrical Power Systems in Commercial Buildings) and in UFC 4-510-01 (Design: Military Medical Facilities). Backup generation shall be provided in compliance with UFC 4-510-01.

Generator Fuel Storage. The fuel storage shall be upgraded if the generators are upgraded. The work shall include the fabrication and installation of fuel storage tanks, if needed. Contractor shall provide a day tanks capable of supplying the generator for 4 hours and a back up supply tank capable of hold enough fuel to operate the generator for a 24 hour period. Tanks shall be skid mounted. Tanks of this type that have a capacity above 2640 L will be provided with either a dike or a spill containment system. The dike or spill containment system should have enough capacity for the entire contents of the tank, plus 10 percent. Provide a molded neoprene isolation pad to isolate an above-ground tank from the concrete pad underneath. Steel tank supports specifically are prone to encounter premature rusting due to constant exposure to moisture and their incompatibility with concrete. Tank shall be designed and manufactured for horizontal installation. Tank shall be mounted on the tank manufacturer's standard support skid. Skid shall span the entire length of the tank and shall separate the tank from the reinforced concrete slab by a minimum of 200 mm. Indicate on the drawings the number and size of each tank man way required. Tanks of 3,780 to 45,430 L to capacity will be provided with 760 mm diameter man ways. Tanks larger than 45,430 L will be provided with 915 mm diameter man ways. Tanks 3,780 L and larger will be provided with a minimum of 1 tank man way to allow for internal tank access. Piping will not penetrate through access man ways. Tank shall be provided with a combination cleanout and gauge connection. Vent pipe sizing shall be not less than 32 mm nominal inside diameter. Vent shall be the rupture disc type calibrated to burst at 13.8 kPa pressure, and operate at 80 percent of burst setting. Tank shall be provided with an overfill alarm system. Tank shall be provided with 2 stick gauges graduated in m and mm. Stick gauge shall be of wood and treated after graduating to prevent swelling or damage from the fuel being stored. Each storage tank shall be provided with an automatic analog reading gauge which is directly mounted to a tank's man way cover. Provide an in-line centrifugal pump as part of the day tank package for fuel transfer from the bulk storage tanks to the day tank. Day tanks shall provide sufficient fuel for four hours of generator operation without refill. Provide cathode protection for metal components. Storage tanks shall be handled with extreme care to prevent damage during placement and shall be installed in accordance with the manufacturer's installation instructions. Piping shall be inspected, tested, and approved before buying, covering, or concealing. Piping shall be installed straight and true to bear evenly on supports. Piping shall be free of traps, shall not be embedded in concrete pavement, and shall drain toward the corresponding storage tank. Any pipe, fittings, or

appurtenances found defective after installation shall be replaced. Below ground nonmetallic pipe shall be installed in accordance with pipe manufacturer's instructions. Belowground piping shall be laid with a minimum pitch of 25 mm per 6 m.

4.9 LIGHTING

General lighting shall be provided as indicated and shall meet recommendations from IESNA for each building type and function within each building. Design and installation shall meet NEC 70 requirements.

Exterior lighting shall be high intensity discharge luminaries on 10 meter high minimum spun aluminum or galvanized steel poles. If to be installed on an existing installation, type of luminaries shall match existing predominant type within installation.

4.10 GEOTECHNICAL

Existing geotechnical information is not available at the project site. Any site-specific geotechnical data required to develop foundations, materials, earthwork, and other geotechnical related design and construction activities for this project shall be the Contractor's responsibility. The Contractor shall develop all pertinent geotechnical design and construction parameters by appropriate field and laboratory investigations and analyses. The Contractor shall produce a detailed geotechnical report containing field exploration and testing results, laboratory testing results (particle sizes and distribution, liquid and plastic limit test, and moisture and density test, etc). Information in the report shall include, but not limited to: existing geotechnical (e.g. surface and subsurface) conditions, location of subsurface exploration logs on site plan, exploration point, allowable soil bearing capacity and foundations recommendations, bearing capacity, pavement design criteria (e.g. CBR values, K values), ground-water levels, and construction materials (e.g. concrete cement, asphalt, and aggregates). Two copies of the detailed geotechnical report shall be submitted to the Contracting Officer.

Foundations, including sub-grade, shall be designed and constructed based on recommendations from geotechnical investigation required herein.

4.111 FORCE PROTECTION

Facilities shall be sited with FP design in mind. As much as possible and practicable FP designs shall be accomplished by appropriate stand-off distances and setbacks away from potential threats. Force Protection design shall be in accordance with section 1015, Technical Requirements. Force Protection

4.12 FENCING AND BARRICADES

Fencing shall consist of the types shown or described herein.

4.13 ROAD NETWORK, SIDEWALK, AND PARKING

The Contractor shall design and construct the entire road and parking network. The roads shall be designed to carry traffic of up to an 18 ton three-axle vehicle. A storm drainage system shall also be included. The road layout shall provide access to entry control points, parking lots, vehicle maintenance facilities, fuel points, generator yard, sewage septic tank, and the trash collection point. Provide parking areas for vehicles for the following facilities inside the compound.

The contractor shall design & construct a 25 space parking lot adjacent the new hospital addition facility.

Road design shall be designed per Section 01015, Technical Requirements. Roadways and sidewalks are required as shown on attached drawings and shall be designed and constructed based upon recommendations from geotechnical analysis as required herein.

The Contractor shall design and provide landscaping for the compound. Design and provide a network of concrete sidewalks to connect the buildings. Sidewalks shall be wide enough to be used as fire-lane or service roads. Provide outdoor benches, lighting, and gathering areas.

4.14 TRASH POINT

The Contractor shall design, in a location convenient for easy removal, a trash collection point at this site as part of the site work per the base bid schedule items. There will be one trash point at this facility to be included as part of the design package as determined by the contractor shall be located outside the facility. The trash point shall be a 1800 mm x 1800 mm concrete pad with a 1800 mm height chain link fence around the perimeter. One side shall have a 1200 mm wide gate entrance. Trash Points shall have a metal roof covering. .

5.0 COMPLETION OF WORK

The work of this contract is phased as follows:

All work required under this contract shall be completed within **360** calendar days including government review time from Notice to Proceed for site work

6.0 SPARE PARTS

Refer to other sections herein for requirements.

7.0 REFERENCES

Refer to Section 01015 for required references.

-- End of Section --

SECTION 01015 TECH REQUIREMENT

SECTION 01015

TECHNICAL REQUIREMENTS – DESIGN/BUILD

1.0 GENERAL

1.1 COMPLIANCE

The Contractor's design and construction must comply with technical requirements contained herein. The Contractor shall provide design and construction using the best blend of cost, construction efficiency, system durability, ease of maintenance and environmental compatibility.

1.2 MINIMUM & ALTERNATE REQUIREMENTS

These design and product requirements are minimum requirements. The Contractor is encouraged to propose alternate design or products (equipment and material) that are more commonly used in the region; will be equally or more cost effective or allow for more timely completion, but furnish the same system safety, durability, ease of maintenance and environmental compatibility. The Contractor will be required to submit information as requested by the Contracting Officer to make a comparison of the

proposed alternate. All variations of approved designs must be approved by the Contracting Officer.

1.3 ASBESTOS CONTAINING MATERIALS

Asbestos containing material (ACM) shall not be used in the design and construction of this project. If no other material is available which will perform the required function or where the use of other material would be cost prohibitive, a waiver for the use of asbestos containing materials must be obtained from the Contracting Officer.

1.4 SAFETY

1.4.1 Unexploded Ordnance (UXO)

1.4.1.1 UXO/Mine Discovery during Project Construction

It is the responsibility of the Contractor to be aware of the risk of encountering UXO and to take all actions necessary to assure a safe work area to perform the requirements of this contract. If during construction, the contractor becomes aware of or encounters UXO or potential UXO, the contractor shall immediately stop work at the site of encounter, move to a safe location, notify the COR, and mitigate any delays to scheduled or unscheduled contract work. Once the contractor has informed the COR, the contractor will await further direction. The Contractor assumes the risk of any and all personal injury, property damage or other liability arising out of or resulting from any Contractor action taken hereunder.

NOTE: For previous UXO/mine information, the following points of contact from the UN Mine Action Center of Afghanistan are provided:

Mohammad Sediq, Chief of Operations,
Email: sediq@unmaca.org
Cell: +93 070 295207

Hansie Heymans, Chief Information Officer,
Email: hansie@unmaca.org
Cell: +93 070 294286

1.4.1.1 Explosives Safety

1.4.1.1.1 General Safety Considerations

General safety considerations applicable to personnel, both essential and non-essential, at project sites where UXO may be encountered include:

- a. Do not carry fire or spark-producing devices.
- b. Do not conduct explosive or explosive-related operations without approved procedures and proper supervision and UXO safety support.
- c. Do not become careless by reason of familiarity with UXO or the reported probability level of UXO contamination.
- d. Do not conduct explosive or potentially explosive operations during inclement weather.
- e. Avoid contact with UXO except during UXO clearance operations.
- f. Conduct UXO-related operations during daylight hours only.

- g. Employ the "buddy system" at all times.

1.4.1.1.2 Activity Hazard Analysis (AHA) briefings

- a. Activity Hazard Analysis's shall be prepared in accordance with the Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.
- b. Hazard analyses will be prepared and briefed by personnel that are knowledgeable in UXO and explosives safety standards and requirements. These personnel should understand the specific operational requirement and hazard analysis methodologies. A hazard analysis will be performed for each activity to determine the significance of any potential explosive-related hazards. Explosive residues may be discovered or exposed during UXO operations in the form of powder or various granular and powder based pellets. These contaminants can enter the body through the skin or by ingestion if proper personal hygiene practices are not followed. Explosive fillers such as white phosphorus are dangerously reactive in air and acute exposure can result in serious injury to the skin, eyes, and mucous membranes. They are also a fire hazard.

Safety requirements (or alternatives) that will either eliminate the identified hazards, mitigate or control them to reduce the associated risks to an acceptable level will be developed. The adequacy of the operational and support procedures that will be implemented to eliminate, control, or abate identified hazards or risks will then be evaluated and a second risk assessment completed to verify that a satisfactory safety level has been achieved.

1.4.1.2 Notification of Noncompliance

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall make no part of the time lost due to such stop orders the subject of claim for extension of time or for excess costs or damages.

1.5 LIMITATION OF WORKING SPACE

The Contractor shall, except where required for service connections or other special reason(s), confine his operations strictly within the boundaries of the site. Workmen will not be permitted to trespass on adjoining property. Any operations or use of space outside the boundaries of the site shall be by arrangement with all interested parties. It must be emphasized that the Contractor must take all practical steps to prevent his workmen from entering adjoining property and in the event of trespass occurring the Contractor will be held entirely responsible.

Areas located immediately outside the construction area are known to contain mines and unexploded ordnance (UXO). Contractors assume all risks when venturing in or out of the designated work area.

1.6 TEMPORARY STRUCTURES

The Contractor shall erect suitable temporary fences, lighting, and necessary structures to safeguard the site, materials and plant against damage or theft and for the protection of the general public and shall adequately maintain the same throughout the course of the contract.

1.7 SUBCONTRACTORS

Compliance with the provisions of this section by subcontractors will be the responsibility of the contractor.

1.8 LIST OF CODES AND TECHNICAL CRITERIA:

The following codes and technical criteria and those referenced therein shall be required for this project. References within each reference below shall be required and adhered to. This list is not exhaustive and is not necessarily complete.

AABC - Associated Air Balance Council (National Standards for total System Balance)

ACI 318 Building Code Requirements for Structural Concrete (latest edition), American Concrete Institute
Air Force Manual 32-1071, Security Engineering, volumes 1-4, 1 May 1994

American Water Works Association, ANSI/AWWA C651-99 standard

ARI - Air Conditioning and Refrigeration Institute

ASCE 7-02, Minimum Design Loads for Buildings and Other Structures, 2002

ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning
Engineers Handbooks: Fundamentals; HVAC Systems and Equipment; HVAC Applications; Refrigeration.

ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy

ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

ASHRAE Standard 62.2-2004, Ventilation and Acceptable Indoor Air Quality for Low-Rise Residential

ASHRAE Standard 90.1-2001, Energy Standard for Buildings Except Low-Rise Residential Buildings

ASHRAE Standard 90.2-2004 with 2006 supplement, Energy-Efficient Design of Low-Rise Residential Buildings

ASME - American Society for Mechanical Engineering

ASTM - American Society for Testing and Materials

AWS - American Welding Society

DCID 6/9 Physical Security Standards for Sensitive Compartmented Information Facilities

DCID 1/21, Manual for Physical Security Standards For Sensitive Compartmented Information Facilities (SCIF)

EIA ANSI/TIA/EIA-607: (1994) Commercial Building Grounding/Bonding Requirement Standard

Factory Mutual (FM) Approval Guide-Fire Protection (2002)

IBC - International Building Codes, 2006 or latest edition (and its referenced codes including those inset below)

IEEE C2, National Electrical Safety Code (NESC), latest edition

IFGC – International Fuel Gas Code

IMC – International Mechanical Code

IPC – International Plumbing Code

Lighting Handbook, IESNA, latest edition

MIL-HDBK-1190, Facility Planning and Design Guide

MIL-HDBK-1191. Design of Medical Facilities

Codes and Standards of the National Fire Protection Association (NFPA)

[as applicable and enacted in 2002 or later, unless otherwise noted]

National Electrical Safety Code (NESC), Institute of Electrical and Electronic Engineers (IEEE C2), 2002 edition

NFPA 10, Portable Fire Extinguishers, 2002 edition

NFPA 13, Fire Sprinkler Systems, 2003 edition

NFPA 30, Flammable and Combustible Liquids Code, 2003 edition

NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages, 2003 edition

NFPA 54, National Fuel Gas Code, 2002

NFPA 58, Liquefied Petroleum Gas Code, 2004

NFPA 70, National Electrical Code, 2005 edition

NFPA 72, National Fire Alarm Code, 2002 edition

NFPA 75, Standard for the Protection of Information Technology Equipment

NFPA 80, Fire Rated Door Assemblies, 2002 edition

NFPA 90A, Air Conditioning and Ventilating Systems, 2002 edition
NFPA 96, Fire Protection for Commercial Kitchen Operations, 2008 edition
NFPA 101, Life Safety Code, 2006 edition
NFPA 110, Standard for Emergency and Standby Power Systems, 2005 edition
NFPA 252, Fire Rated Wall Assemblies, 2002 edition
Plumbing and Drainage Institute (PDI-WH-201) water hammer arrestors
SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Standards and Guides, latest editions
International Mine Action Standards, latest edition; (see <http://www.mineactionstandards.org> for copy of standards)
TM 5-785 Weather Data
TM 5-802-1 Economic Studies
TM 5-805-4 Noise and Vibration
TM 5-811-1 Electrical Power Supply and Distribution
UFC 1-200-01, Design: General Building Requirements, 20 June 2005
UFC 1-300-07A Design Build Technical Requirements
UFC 3-230-03a, Water Supply, 16 Jan 2004
UFC 3-230-04a, Water Distribution, 16 Jan 2004
UFC 3-230-06a, Subsurface Drainage, 16 Jan 2004
UFC 3-230-07a, Water Supply: Sources and General Considerations, 16 Jan 2004
UFC 3-230-08a, Water Supply: Water Treatment, 16 Jan 2004
UFC 3-230-09a, Water Supply: Water Storage, 16 Jan 2004
UFC 3-230-10a, Water Supply: Water Distribution, 16 Jan 2004
UFC 3-230-13a, Water Supply: Pumping Stations, 16 Jan 2004
UFC 3-230-17FA, Drainage in Areas Other than Airfields, 16 Jan 2004
UFC 3-240-03N, Operation and Maintenance: Wastewater Treatment System Augmenting Handbook, 16 Jan 2004
UFC 3-240-04a, Wastewater Collection, 16 Jan 2004
UFC 3-260-01, Airfield and Heliport Planning and Design, 1 Nov 2001 with changes dated 19 May 2006
UFC 3-260-02, Pavement Design for Airfields, 30 June 2001
UFC 1-300-09N, Design Procedures, 25 May 2005
UFC 3-310-01, Structural Load Data, 25 May 2005
UFC 3-400-01, Design: Energy Conservation, 5 July 2002
UFC 3-410-01FA Heating, Ventilating and Air Conditioning, Change 1, 15 May 2003
UFC 3-410-02A, HVAC Control Systems, 15 May 2003
UFC 3-410-04N, Industrial Ventilation, 25 October 2004
UFC 3-420-01, Plumbing Systems Design, 19 June 2003
UFC 3-430-01FA, Heating and Cooling Distribution Systems, 27 July 2003
UFC 3-460-01, Petroleum Fuel Facilities, 16 January 2004
UFC 3-501-03N, Electrical Engineering Preliminary Considerations, 16 Jan 2004
UFC 3-520-01, Interior Electrical Systems, 10 June 2002
UFC 3-530-01AN, Design: Interior and Exterior Lighting and Controls, 19 Aug 2005
UFC 3-535-01, Visual Air Navigation Facilities, 17 November 2005
UFC 3-540-04N Design: Diesel Electric Generating Plants, 16 Jan 2004
UFC 3-550-03FA Design: Electrical Power Supply and Distribution Systems, 1 Mar 2005
UFC 3-600-01, Design: Fire Protection Engineering for Facilities, 26 Sept 2006
UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 22 Jan 2007
UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 19 Jan 2007
UFC 4-020-01FA, Security Engineering: Project Development, 1 Mar 2005
UFC 4-020-02FA, Security Engineering: Concept Design, 1 Mar 2005
UFC 4-020-03FA, Security Engineering: Final Design, 1 Mar 2005
UFC 4-020-04FA, Electronic Security Systems: Security Engineering, 1 Mar 2005
UFC 4-021-01, Design and O&M: Mass Notification Systems, draft 1 May 2006
UFC 4-022-01, Security Engineering: Entry Control Facilities/Access Control Points, 25 May 2005
UFC 4-722-01, Design: Dining Facilities, 27 January 2003

Underwriters' Laboratories (UL) Fire Protection Equipment Directory (2002)
UL Standards (as applicable)
UL 710, Exhaust Hood for Commercial Cooking Equipment, latest edition
UL 737, Fireplace Stoves, latest edition
UL 752, Bullet Resisting Equipment, 2000 or later
USCINCCENT OPOD 97-1

The publications to be taken into consideration shall be those of the most recent editions.
Unified Facility Criteria (UFC) is available online at http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4

Standards other than those mentioned above may be accepted if the standards chosen are internationally recognized and meet the minimum requirements of the specified standards. The Contractor shall be prepared to submit proof of this if requested by the Contracting Officer.

2.0 SITE DEVELOPMENT

2.1 GENERAL

The project includes furnishing all materials, equipment and labor for constructing water, sanitary sewer and storm sewer service lines, as applicable, and connecting to the existing or new sewer networks.

2.2 ENVIRONMENTAL PROTECTION

2.2.1 Applicable regulations

The Contractor shall comply with all Host Nation laws, rules, regulations or standards concerning environmental pollution control and abatement with regard to discharge of liquid waste into natural streams or manmade channels. The contractor shall review host nation and U.S. Government environmental regulations with the contracting officer prior to design and discharge of any liquid wastes into natural streams or manmade channels.

2.2.2 Notification

The Contracting Officer will notify the Contractor in writing of any observed non-compliance with the foregoing provisions. The Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or damages will be awarded to the Contractor unless it was later determined that the Contractor was in compliance.

2.2.3 Spillages

Measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and construction materials from polluting the construction site and surrounding area.

2.2.4 Disposal

Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., shall be taken to a dumpsite off site and subject to the approval of the Contracting Officer. Burning at the project site for the disposal of refuse and debris will not be permitted.

2.3 CIVIL SITE DEVELOPMENT

2.3.1 Site Plan

The contractor shall prepare plat or plan of property as part of the design package consisting of a Boundary Survey of Mazar-e-Sharif Province in the city of Mazar-e-Sharif, Afghanistan. The survey shall show the closure of the property boundary consisting of identifying all property corners, establishing horizontal and vertical control listing all bearing and distances of property lines from the centerline of all adjacent roads. The contractor shall place property corner markers and a monument on the property showing site elevations, coordinate grid systems and WGS 84 latitude longitude. This survey shall meet the requirements of World Geodetic System 1984 (WGS 84 UTM Zone 41N in decimal degrees. The survey design shall include topographic map and the locations of all building corners, structures, major trees, road right of ways, names of roads, widths of roads, easements, right of ways, setbacks, parking and paving areas, storage containers, stoops, sidewalks and walkways, above ground utilities and electrical locations. The contractor shall identify and show all adjacent facilities and features associated with this project. The contractor shall locate the facility in general agreement with the drawings included and any requirements in the Scope of Work, section 01010. All site features shall be clearly defined and dimensioned on the site plan. Buildings shall be located to provide access for emergency vehicles and fire fighting. Roads and parking areas shall be designed for turning radius of the largest vehicle entering the compound. The site plan shall show geometric design of the site, including applicable dimensions of all exterior facilities, mechanical equipment, pavements, utilities, etc. Required facilities are described in the following sections of this specification. Design and construction of roads and pavements shall be based on recommendations from geotechnical investigation required herein.

All site plans and master plans shall be drawn in the following projection and datum for incorporation into the U.S. Army Corps of Engineers GIS system:

WGS 1984 UTM Zone 41N

2.3.2 Demolition

Demolition shall include removal of all structures, foundations, pavements, and utilities, and clear and grubbing. All refuse and debris shall be disposed of off site. Scrap metal shall be the property of the Host Government. The scrap metal on site shall be moved to an area away from the site perimeter as directed by the Contracting Officer's Representative and left for the Host Government to remove and/or salvage.

Demolished fencing and concertina wire shall be neatly rolled up for reuse by the host government. Likewise, used fence posts and outriggers shall be neatly stockpiled for reuse by the host government.

2.3.3 Site Grading & Drainage

The contractor will provide all necessary grading to insure adequate drainage so that no areas will be flooded due to a rainfall of a 10-year frequency. Drainage of the area should be compatible with the existing terrain. Building ground floor finished elevation shall be a minimum 150mm above adjacent grade and outside grade shall slope away from the building on all sides at a minimum slope of 5% for a distance of 3 meters. Holes and depressions shall be backfilled. Fill materials shall be composed of satisfactory soils or aggregates defined in ASTM D 2487 as GW, GP, GM, SP, SM, SW, SC, or CL-ML. Minimum soil compaction shall be 95 percent of maximum density as defined in ASTM D 1557.

2.3.4 Paving

2.3.4.1 Roads

Paved roads are required within the new facility site area. All pre-existing conditions are undeveloped land with gentle slopes, without substantial vegetation and with natural drainage channels of moderate size and spacing that are dry most of the time. All roads shall be of wearing surface 7.3 meters (24 feet) wide, unless otherwise noted, graded for proper drainage, provided with necessary drainage structures and completed with prescribed surfaces in accordance with applicable sections of TM 5-822-2 and TM 5-

822-5 standards. The roads sections shall have 250 mm (10 inch) compacted base course minimum and shall be surfaced with minimum 75 mm (3 inch) hot mix asphalt concrete, unless otherwise noted. Contractor shall notify the Contracting Officer immediately if initial site survey determines that area hydrology requires major drainage structures or bridges. Also, the Contracting Officer shall be immediately notified if the required lengths of road or preexisting conditions are determined to be substantially or materially different than the above-described conditions/estimates. Initial site survey determines that area hydrology requires major drainage structures or bridges.

2.3.4.2 Site Grading Plan

Preliminary investigation indicates no need for bridges or major drainage structures. The Contractor shall notify the Contracting Officer immediately if initial site survey determines that area hydrology requires major drainage structures or bridges. The contractor shall design a site grading plan that provides positive drainage and minimizes the requirement for major structures in a cost effective manner.

2.3.4.3 Parking Areas

Contractor shall construct parking and storage areas using asphalt concrete surface. Subgrade shall be scarified and compacted to 95% proctor density. Aggregate base shall be 150mm (6 inches) for parking areas. Asphalt paving course layer shall be 50 mm (2 inches). All paving work must be performed within the reference codes and specifications and applicable ASTM standards.

2.4 FORCE PROTECTION DESIGN

The Force Protection design shall incorporate minimum setbacks for new facilities to maximum extent possible as permitted by size of the site and the requirements of the user. Force protection design shall be in accordance with Joint Security Directorate Antiterrorism/Force Protection Guide, March 2002. Force Protection design shall also meet the requirements of UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 8 Oct 2003 and UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 8 Oct 2003 and Joint Security Directorate Antiterrorism/Force Protection Guide, March 2002.

2.4.1.1 Chain-Link Fence and Gates

Provide chain-link fence and gates around DFAC storage yard and gate fabric shall be No. 9 gage wires woven into a 50 mm diamond mesh. Fabric shall be coated with 366 grams per square meter zinc galvanizing. Posts shall be ASTM F 1083 Pipe, Steel, Hot Dipped Zinc Coated (Galvanized) Welded or equal. Top of fence and gates shall be provided with outriggers and reinforced barbed tape as indicated above. Post sizes shall be as shown on drawings.

The gates shall be swing type. Hinged gates shall be a pair of 3.65 m wide x 2.4 m high leafs, constructed of a steel tube frame and steel tube intermediate posts and rails. The design of the gates shall insure that it is dimensionally stable, square, true and planar. Gate leafs shall not rack or deflect when install on its hinges. Gates shall have a sufficient number of hinges, anchor mounted to the exterior masonry walls, to support each gate leaf. Provide a locking mechanism that holds the gates together when in the closed position as well as a drop bolt that engages a steel sleeve embedded in the pavement.

2.5 CIVIL UTILITIES

2.5.1 General

The design of the water and sanitary systems shall be sized to provide flow and discharge based on a fixture unit basis. The design drawings shall show all utility lines, line sizes, valves, manholes, cleanouts, disinfection systems, and applicable details associated with water and sanitary system designs.

Specifications covering water lines, valves, pumps, controls, sanitary sewers and storm sewers shall be submitted as part of the design and shall require standard materials that are available in-country. Contractor shall install and connect exterior sanitary sewer collection and water supply piping to service connection points of each facility requiring such.

2.5.2 Water

2.5.2.1 General

Infrastructure design and construction shall serve the demand. The Contractor shall install water distribution mains, branches, laterals, lines and service connections to include all pipe, valves, fittings and appurtenances. Exterior water line construction shall include service to all buildings as described in the Scope of Work Section 01010. In the event potable or non-potable use water is required prior to completion of the water facilities infrastructure the Contractor may be issued a Request for Proposal to provide non-potable (tank truck) and potable (bottled or other reliable source) consumption. Provide a minimum of one (1) outside water hydrant (hose spigot) for any building or facility for which a water supply is provided for landscaping purposes.

2.5.3 Water Distribution System

2.5.3.1 General

The Contractor shall provide a water distribution system described as follows and as directed in the 01010 SOW: Pipe diameters used in the network shall be 300mm (12 inch), 250mm (10 inch), 200mm (8 inch), 150mm (6 inch) and 100mm (4 inch), as calculated, using ductile iron (DI) conforming to AWWA C151, installed in accordance with C 600 or polyvinyl chloride (PVC) as per ASTM D 1784 and 1785. All pipes and joints shall be capable of at least 1.03 MPa (150 psi) and 1.38 MPa (200psi) hydrostatic test pressure unless otherwise specified. Pipes should be adequate to carry the maximum quantity of water at acceptable velocities 0.9 to 1.5m/sec (3 to 5 ft/sec) at maximum flows not to exceed 2.8m/sec (9.2ft/sec). **Minimum pressure shall be 140kPa (35psi) to all points of the distribution system and maximum pressure shall be 517kPa (75psi).** If high pressures (greater than 690kPa) cannot be avoided, pressure-reducing valves shall be used. Water service connections to buildings shall vary from 19mm, 25mm or 38mm to 75mm, as calculated, depending on the usage requirement. Pipe service connections from the distribution main to the building shall be either Polyvinyl Chloride (PVC) plastic Schedule 80 ASTM D 1785 or copper tubing conforming to ASTM B 88M, Type K, annealed. After choosing piping material type, use similar piping materials for all buildings for efficiency of future maintenance activities. The distribution network shall be laid out in a combination grid and looped pattern with dead ends not exceeding 30m (99 feet). Dead end sections shall not be less than 150mm (6 inch) diameter and shall either have blow off valves or fire hydrants (flushing valves) installed for periodic flushing of the line. Any pipe with a fire hydrant on the line shall be at least 150mm (6 inch) in diameter. Water supply distribution shall connect to a building service at a point approximately 1.5m (5 feet) outside the building or structure to which the service is required. Adequate cover must be provided for frost protection. A minimum cover of 800mm (2'-8") is required to protect the water distribution system against freezing. Water lines less than 1.25 meters (4 feet) deep under road crossings shall have a reinforced concrete cover of at least 150 mm (6 inch) thickness around the pipe extending out to 1m from each road edge.

2.5.3.2 Pipe

The Contractor shall provide pipe of adequate strength, durability and be corrosion resistant with no adverse effect on water quality. The exterior surface of the pipe must be corrosion resistant. If the pipe is installed underground pipe shall be encased with polyethylene in accordance with AWWA C105. Water distribution pipe material shall be PVC or Ductile Iron (DI). Ductile iron pipe shall conform to AWWA C104, etal. DI fittings shall be suitable for 1.03MPa (150psi) pressure unless otherwise specified.

Fittings for mechanical joint pipe shall conform to AWWA C110. Fittings for use with push-on joint pipe shall conform to AWWA C110 and C111. Fittings and specials shall be cement mortar lined (standard thickness) in accordance with C104. Polyvinyl Chloride (PVC) pipe shall conform to ASTM D 1785. Plastic pipe coupling and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B. PVC screw joint shall be in accordance with ASTM D 1785, etal, Schedules 40, 80 and 120. PVC pipe couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B. Pipe less than 80mm (3 inch), screw joint, shall conform to dimensional requirements of ASTM D schedule 80. Elastomeric gasket-joint, shall conform to dimensional requirements of ASTM D 1785 Schedule 40, All pipe and joints shall be capable of 1.03 MPa (150psi) working pressure and 1.38 MPa (200psi) hydrostatic test pressure.

2.5.3.3 Hydrostatic, Leakage and Disinfection tests

The Contracting Officer will be notified not less than 48 hours in advance of any water piping test and will be given full access for monitoring testing procedures and results. Where any section of water line is provided with concrete thrust blocking for fittings or hydrants, tests shall not be made until at least 5 days after installation of concrete thrust blocking, unless otherwise approved.

2.5.3.4 Pressure Test

After the pipe is laid, the joints completed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 1.38 MPa (200 psi). Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants and valves shall be carefully examined during the partially opened trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered following this pressure test shall be removed and replaced and retested until the test results are satisfactory.

2.5.3.5 Leakage Test

Leakage tests shall be conducted after all pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and, during the test, water lines shall be subjected to not less than 1.38 MPa (200 psi). Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure to within 34.5kPa (5 psi) of the specified leakage test pressure after the pipe has been filled with water and all air expelled. Pipe installation will not be accepted if leakage exceeds the allowable leakage, as determined by the following formula:

$L = 0.0001351ND (P \text{ raised to } 0.5 \text{ power}), \text{ where}$

L = Allowable leakage in gallons per hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional

cost to the government.

2.5.3.6 Bacteriological Disinfection

2.5.3.6.1 Disinfection Procedure

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. After pressure tests have been completed, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. Flushing will be performed in a manner and sequence that will prevent recontamination of pipe that has previously been disinfected. The chlorinating material shall be liquid chlorine, calcium hypochlorite, or sodium hypochlorite. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the water lines in an approved manner. Polyvinyl Chloride (PVC) pipelines shall be chlorinated using only the above-specified chlorinating material in solution. The agent shall not be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. Valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period, each fire hydrant on the line shall be opened and closed several times.

2.5.3.6.2 Sampling

For each building connected to the water system, personnel from the Contractor's commercial laboratory shall take at least 3 water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with approved methods. The commercial laboratory shall be verified to be qualified by the appropriate authority for examination of potable water.

2.5.3.6.3 Acceptance Requirements

The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

2.5.3.6.4 Time for making Tests

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipeline jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.

2.5.3.6.5 Concurrent Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be recorded for submission and approval. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government. Pressure and leakage testing may be conducted concurrently, Hydrostatic tests and disinfection may be conducted concurrently, using water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be re-accomplished.

2.5.3.7 Valves

Valves (Gate valves w/box) shall be placed at all pipe network tees and cross intersections, and the number of valves shall be one less than the number of lines leading into and away from the intersection. For isolation purposes valves shall be spaced not to exceed 3600 mm (12 feet). Gate valves shall be in accordance with AWWA C 500 and/or C509. Butterfly valves (rubber seated) shall be in accordance with C504 et al. The valves and valve boxes shall be constructed to allow a normal valve key to be readily used to open or close the valve. Provide traffic-rated valve boxes. Provide concrete pad, 1 meter (3'-4") square, for all valve boxes.

2.5.3.7.1 Vacuum and Air Release Valves

Air release valves are required to evacuate air from the main high points in the line when it is filled with water, and to allow the discharge of air accumulated under pressure. Vacuum relief valves are needed to permit air to enter a line when it is being emptied of water or subjected to vacuum. Contractor shall submit manufacturer's data for properly sized combination air and vacuum release valves and determine their locations on the distribution system subject to review and approval of the Contracting Officer.

2.5.3.7.2 Blow-Off Valves

The Contractor shall provide 40-50mm (1-5/8" – 2") blow-off valves at ends of dead end mains. Valves should be installed at low points in the mains where the flushing water can be readily discharged to natural or manmade drainage ditches, swales or other.

2.5.3.8 Thrust Blocking

Contractor shall provide concrete thrust blocking at any point where the layout of the system changes the direction of the flow, increases the velocity, or decreases or stops the flow. At these points, the pipes and fittings must be anchored and kept from moving or pulling apart by the use of thrust blocks installed against undisturbed earth.

2.5.4 Sanitary Sewer

2.5.4.1 General

The sanitary sewer system for the hospital addition shall be connected to the existing sanitary sewer collection system at the compound. Contractor will evaluate the capacity of any existing sanitary sewer lateral and branches which the new sanitary sewer system connects to. If the capacity is found to be deficient, the contractor shall either connect directly to an existing sanitary sewer main or upgrade the existing lateral or branch to handle the additional load. Sanitary sewers less than 1.25 meters (4 feet) under road crossings shall have reinforced concrete cover at least 150 mm (6 inch) thick around the pipe. Concrete cover will extend out to at least 1 m from each road edge.

Exterior sanitary sewer line construction shall include service to all buildings as described in the Scope of Work Section 01010. Contractor shall design sanitary sewer collection system using approved field survey data and finished floor elevations. Depending upon the topography and building location, the most practical location of sanitary sewer lines is along one side of the street. In other cases they may be located behind buildings midway between streets. Main collection sewers will follow the most feasible route to the point of discharge. The sewer collection system shall be designed to accommodate the initial occupancy and a reasonable expansion capability. All sewers shall be located outside of the roadways as much as practical, and minimize the number of roadway crossings. To the extent practical, a sewer from one building shall not be constructed under another building, or remain in service where a building is subsequently constructed over it. Construction required shall include appurtenant structures and building sewers to points of connection with building drains 1.5m (5 feet) outside the building to which the sewer collection system is to be connected.

The Contractor shall use the following criteria where possible to provide a layout which is practical, economical and meets hydraulic requirements:

- a. Follow slopes of natural topography for gravity sewers.
- b. Check subsurface investigations for groundwater levels and types of subsoil encountered. If possible, avoid areas of high groundwater and the placement of sewers below the groundwater table.
- c. Avoid routing sewers through areas which require extensive restoration or underground demolition.
- d. Depending upon the topography and building locates, the most practical location of sanitary sewer lines is along one side of the street. In other cases they may be located behind buildings midway between streets. The intent is to provide future access to the lines for maintenance without impacting vehicular traffic.
- e. Avoid placing manholes in low-lying areas where they could be submerged by surface water or subject to surface water inflow. In addition, all manholes shall be constructed 50 mm higher than the finished grade, with the ground sloped away from each manhole for drainage.
- f. Sewer lines shall have a minimum of 800 mm of cover for frost protection.
- g. Locate manholes at change in direction, pipe size, or slope of gravity sewers.
- h. Sewer sections between manholes shall be straight. The use of a curved alignment shall not be permitted.
- i. If required by the design, locate manholes at intersections of streets where possible. This minimizes vehicular traffic disruptions if maintenance is required.
- j. Sewer lines less than 1.25 meters deep under road crossings shall have a reinforced concrete cover of at least 150mm thickness around the pipe or shall utilize a steel or ductile iron carrier pipe. It is recommended to continue the reinforced concrete cover or carrier pipe a minimum of one (1) meter beyond the designated roadway.
- k. Verify that final routing selected is the most cost effective alternative that meets service requirements.

2.5.4.2 Protection of Water Supplies

The Contractor shall ensure that the sewer design meets the following criteria:

- a. Sanitary sewers shall be located no closer than 15m (50 feet) horizontally to water wells or reservoirs to be used for potable water supply.
- b. Sanitary sewers shall be no closer than 3 m (10 feet) horizontally to potable water lines; where the bottom of the water pipe will be at least 300mm (12 inches) above the top of the sanitary sewer, horizontal spacing shall be a minimum of 1.8m (6 feet).
- c. Sanitary sewers crossing above potable water lines shall be constructed of suitable pressure pipe or fully encased in concrete for a distance of 2.7m (9 feet) on each side of the crossing. Pressure pipe will be as required for force mains in accordance with local standards and shall have no joint closer than 1m (3 ft) horizontally to the crossing, unless the joint is fully encased in concrete.

2.5.4.3 Quantity of Wastewater

The Contractor shall verify the average daily flow considering both resident (full occupancy) and non-resident (8hr per day) population. The average daily flow will represent the total waste volume generated over a 24-hour period, and shall be based on the total population of the facility and usage rate of 50 gallons (190 liters) per capita day (water usage). The wastewater flow rate shall be calculated as approximately 80% of water usage rate, or 41 gallons per capita day. DFAC kitchen wastewater flows shall be based on the number of meals served per day by the kitchen. Design criteria guideline shall be based on average influent wastewater characteristics as BOD of 250mg/l, SS of 250mg/l, BOD load of 750ppd, and SS load of 750ppd.

2.5.4.4 Gravity Sewer

Sanitary sewers shall be designed to flow at a maximum in the following way: Trunk Sewers - 90 percent full; Laterals and Mains – 80 percent full, Building connections (service) – 70 percent full. Sanitary sewer velocities shall be designed to provide a minimum velocity of 0.6 meters per second (mps) or 2.0 feet per second (fps) at the ADD flow rate and a minimum velocity of 0.8 to 1.05 mps (2.5-3.5fps) at the peak diurnal flow rate. In no case shall the velocity drop below 0.3 mps, (1.0 fps) to prevent settlement of organic solids suspended in the wastewater. Pipe slopes shall be sufficient to provide the required minimum velocities and depths of cover on the pipe. Unless otherwise indicated (see Building Connections and Service Lines), gravity sewer pipe shall be installed in straight and true runs in between manholes with constant slope and direction. Adequate cover must be provided for frost protection. A minimum cover of 800 mm (2'-8") will be required to protect the sewer against freezing.

Table 1. Minimum Slopes for Sewers.

Sewer Size	Minimum Slope in Meters per 100 Meters
100 mm	1.00
150 mm	0.62
200 mm	0.40
250 mm	0.28
300 mm	0.22
350 mm	0.17
375 mm	0.15
400 mm	0.14
450 mm	0.12
525 mm	0.10
600 mm	0.08

2.5.4.5 Manholes

The Contractor shall provide standard depth manholes (MH), (depth may vary) an inside dimension of 1.2m (4 ft). Manholes shall be made of cast-in-place reinforced concrete with reinforced concrete cover. Alternate pre-cast manhole option shall taper to a 750 mm (30-inch) cast iron frame that provides a minimum clear opening of 600 mm (24 inches). In every case, the manholes, frames and covers shall be traffic rated, H-20 load rating. All manholes shall be provided with a concrete bench with a flow line trough, smoothly formed to guide waste flow to the outlet pipe from the inlet pipe(s). The top surface of the bench shall be above the crown of all pipes within the manhole. All surfaces of the bench shall be sloped smoothly toward the trough to guide flow, even under peak flow conditions.

2.5.4.5.1 Manhole Design Requirements

Manholes are required at junctions of gravity sewers and at each change in pipe direction, size or slope, except as noted hereinafter for building connections.

2.5.4.5.2 Spacing

The distance between manholes must not exceed 120m (400 ft) in sewers of less than 460mm (18 in) in diameter. For sewers 460mm (18 in) and larger, and for outfalls from wastewater treatment facilities, a spacing of up to 180m (600 ft) is allowed provided the velocity is sufficient to prevent sedimentation of solids.

2.5.4.5.3 Pipe Connections

The crown of the outlet pipe from a manhole shall be on line with or below the crown of the inlet pipe.

2.5.4.5.4 Frames and Covers

Frames and covers shall be cast iron, ductile iron or reinforced concrete, traffic rated in any case to an H-20 load rating. Cast iron frames and covers shall be traffic rated, circular with vent holes.

2.5.4.5.5 Steps for Manholes

Steps shall be cast iron, polyethylene coated, at least 15mm (5/8 in) thick, not less than 400mm (16 in) in width, spaced 300mm (12 in) on center.

2.5.4.5.6 Grease Interceptor

Follow guidance provided in ICC IPC 2006 and EPA 625/80-1-012, Onsite Wastewater Treatment and Disposal Systems, for design of the grease trap required for the DFAC kitchen wastewater drains anticipated to contain grease loading. Drains containing grease loading shall be kept separate from other sanitary sewer until their flows are pretreated by the grease interceptor. Toilets shall never be connected to a grease interceptor.

2.5.4.6 Pipe

Pipe shall conform to the respective specifications and other requirements as follows: Provide Polyvinyl Vinyl Chloride (PVC) conforming to ASTM D 3034, Type PSM with a maximum SDR of 35, size 380 mm (15inch) or less in diameter. PVC shall be certified as meeting the requirements of ASTM D 1784, cell Class 12454 B.

2.5.4.6.1 Fittings

Fittings shall be compatible with pipe supplied and shall have a strength not less than that of the pipe. Fittings shall conform to the respective specifications and requirements as follows: provide PVC fittings conforming to ASTM D 3034 for type PSM pipe.

2.5.4.6.2 Joints

Joints installation requirements shall comply with the manufacturers installation instructions. Flexible plastic pipe (PVC or high density polyethylene pipe) gasketed joints shall conform to ASTM D3212.

2.5.4.6.3 Branch Connections

Branch connections shall be made by use of regular fittings or solvent-cemented saddles as approved. Saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

2.5.4.6.4 The minimum depth of the cover over the pipe crown shall be 0.8m (2 ft 8").

2.5.4.6.5 Building Connections and Service Lines

Building connections and service lines will be planned to eliminate as many bends as practical and provide convenience in rodding. Bends greater than 45 degrees made with one fitting should be avoided; combinations of elbows such as 45-45 or 30-60 degrees should be used with a cleanout provided. Connections to other sewers will be made directly to the pipe with standard fittings rather than through manholes. However, a manhole must be used if the connection is more than 31m from the building cleanout. Service connection lines will be a minimum of 150 mm (6 inch) diameter and laid at a minimum 1% grade, but up to 2% as design parameters dictate. Service laterals shall be 200 mm (8 inch) and sloped to maintain the minimum velocity as described in paragraph "Gravity Sewer."

2.5.4.6.6 Cleanouts

Cleanouts must be installed on all sewer-building connections to provide a means for inserting cleaning rods into the underground pipe. Install manufactured wye fittings. In lieu of a wye fitting, an inspection chamber may be installed. The inspection chamber shall be of the same construction as a manhole. Preferably the cleanout will be of the same diameter as the building sewer, and never be smaller than 150mm (6 in). Cleanouts shall be located within 1m from the building.

2.5.4.6.6.1 Grease Interceptors

Grease interceptors are used to remove grease from wastewater to prevent it from entering the sanitary sewer and septic systems. All Dining Facilities (DFACs) shall incorporate preliminary treatment with use of a grease interceptor prior to the sanitary sewer system. The grease interceptor shall be of reinforced cast-in-place concrete, reinforced precast concrete or equivalent capacity commercially available steel, with removable three-section, 9.5 mm checker-plate cover, and shall be installed outside the building. Steel grease interceptors shall in be installed in a concrete pit and shall be epoxy-coated to resist corrosion as recommended by the manufacturer. Concrete shall have 21 MPa minimum compressive strength at 28 days. The grease interceptor shall connect to the sanitary sewer system.

2.5.4.6.7 Field Quality Control

2.5.4.6.7.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment and incidentals required for testing.

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically a full circle of light through the pipeline when viewed from the adjoining end of the line. When pressure piping is used in a non-pressure line for non-pressure use, test this piping as specified for non-pressure pipe.

Test lines for leakage by either infiltration tests or exfiltration tests. Prior to testing for leakage, backfill trench up to at least lower half of the pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe to prevent movement during testing, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

Infiltration tests and ex-filtration tests: Perform these tests for sewer lines made of specified material, not only concrete, in accordance with ASTM C 969M, ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969M and ASTM 969.

Low-pressure air tests: Perform tests as follows:

- (a) Concrete pipe: Test in accordance with ASTM C 924M, ASTM C 924. Allowable pressure drop shall be given in ASTM C 924M ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M, ASTM C 924;
- (b) Ductile-iron pipe: Test in accordance with the applicable requirements of ASTM C 924M, ASTM C 924. Allowable pressure drop shall be as given in ASTM C 924M, ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M, ASTM C 924;
- (c) PVC Plastic pipe: Test in accordance with applicable requirements of UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

2.5.4.6.8 Deflection Testing

Deflection testing will not be required however; field quality control shall ensure that all piping is installed in accordance with deflection requirements established by the manufacturer.

2.5.5 Storm Sewer Systems

Oil/water separators shall be utilized for all drains from industrial sites. Separators shall be installed as close as possible from the drain location. Storm sewer system shall not be mixed with sanitary sewer system and shall be in accordance with UFC 3-240-03, **referenced** edition.

3.0 ARCHITECTURAL REQUIREMENTS

3.1 GENERAL

All material approved shall become standardized material to be used throughout the facilities under contract. Different sub-contractors shall not use different material or standards under the contract. Intent of the project is to use locally procured materials (unless specified otherwise) and labor to the maximum extent possible while satisfying seismic building code. Conflicts between criteria shall be brought to the attention of the Contracting Officer for resolution. In such instances, the Contractor shall furnish all available information with justification to the Contracting Officer. **All building exterior walls shall be constructed with reinforced CMU, insulated concrete sandwich panels, reinforced concrete or approved equivalent.**

3.2 DESIGN CRITERIA

The Codes, Standards, and Regulations listed herein shall be used in the construction of this project. The publications shall be the [referenced [most recent] editions. Standards other than those mentioned may be accepted provided they meet the minimum requirements and the contractor shall submit proof of equivalency to the Contracting Officer for approval.

IBC - International Building Code, 2006

NFPA 101 - Life Safety Code, 2006.

3.3 LIFE SAFETY/ FIRE PROTECTION/ HANDICAPPED ACCESSIBILITY

To the extent possible, all facilities will be designed in accordance with recognized industry standards for life safety and building egress, to include the reference NFPA and IBC codes. An adequate fire alarm system, fire extinguishers, and smoke alarms shall all be included as required. A sprinkler system is required for the entire facility, to be designed and constructed in accordance with the NFPA 13 reference. The facility shall comply with all other safety requirements of NFPA 101. A fire alarm system is required

and designed in accordance with the NFPA 72 requirements. In keeping with the intended function of these facilities, handicapped accessibility will be incorporated into this project. Use of the UFAS and ADAAG standards are advised in the design of this healthcare facility.

3.4 ANTITERRORISM/ FORCE PROTECTION

Force protection/anti-terrorism measures for this location shall be followed and incorporated into this project in accordance with the referenced DoD Regulations. Information regarding force protection may be found herein and at the following link: www.tisp.org/files/pdf/dodstandards.pdf.

3.5 EXCAVATION

Trench excavation shall be made for concrete footings. Trenches shall be a minimum of .8 meter deep. Trenches deeper than 1.5 meters shall have protective shoring to protect workers or have the sides of the trench sloped back at a slope of 1.5:1. Care shall be taken when backfilling of foundation trenches to avoid damage to walls. Any excess dirt shall become the property of the Contractor and shall be removed from the site to a location approved by the Contracting Officer.

3.6 THERMAL PERFORMANCE OF EXTERNAL BUILDING ASSEMBLIES

External building assemblies shall meet the requirements of TI-800, Design Criteria, UFC 3-400-01 Design: Energy Conservation, and ASHRAE Standard 90.1, latest editions, but shall meet the following minimum requirements:

Exterior walls (above grade)	RSI 1.936 (R 13)
Ceilings/roof	RSI 3.345 (R 30)
Floor (over unheated space)	RSI 3.345 (R 19)
Exterior doors	RSI 0.25 (R 1.43)
Exterior windows/(glazing within doors)	RSI 0.308(R 1.75)

RSI measured in m²-K/W, R measured in sqft-F-hr/BTU.

3.7 CONCRETE & MASONRY

3.7.1 Concrete

Place 150 mm (6") of capillary water barrier below areas to receive a concrete slab on properly compacted soil free of organic material. Concrete flooring in wet areas shall slope to the floor drain and not allow for water to puddle. Concrete slabs in all areas shall not be placed prior to inspection and approval of piping and sub-surface by the Contracting Officer. Foundation trenches shall be level and free of loose material. Trenches shall be inspected and approved by the Contracting Officer prior to placing of any concrete foundations. See paragraph 5 for structural characteristics of concrete and reinforcing steel for foundations and slabs.

3.7.2 Insulated Concrete Sandwich Wall System (3-D Building System)

As an option to standard masonry construction, the Contractor may construct walls of single story buildings using an insulated concrete sandwich wall system. The insulated concrete sandwich wall system shall be field fabricated and composed of a 76 mm (3 inch) expanded polystyrene core that spans in a single piece from floor elevation to top of wall elevation. The polystyrene core shall have a welded wire fabric, 50 mm x 50 mm (2 inch x 2 inch) mesh, 2.52mm (12.5 gauge) wire, attached to both faces of the polystyrene core. The welded wire mesh shall be installed at 13mm from the face of the polystyrene core. The welded wire mesh on each face shall be attached to each other and the polystyrene core with

diagonal truss wires. Apply sprayed concrete (shotcrete) to a minimum thickness of 45mm (1-3/4 inch) or as structural calculations require, whichever is greater. Method of placing the shotcrete shall be in conformance with ACI 506R-85. Concrete finishing shall be done by appropriate hand tools (darby, trowel, etc.) to provide the desired finish effect.

3.7.3 Masonry

Storage of masonry materials shall be in a dry place or materials shall be covered with a plastic protective layer. Cover open walls each day to keep them protected and dry. Concrete masonry units (CMU) for exterior walls shall be either 190 mm or 290 mm wide x 390 mm x 190 mm high as shown on drawings. All cells shall be fully grouted and reinforced. They shall be installed in running bond level and plumb. Mortar joints shall be 10 mm on all sides between CMU. Joints shall be struck with a concave tool to provide a smooth recessed curved surface. Install only quality units. The surface shall be free of chips, cracks, or other imperfections that would detract from the overall appearance of the finished wall. Defective CMU or mortar shall be rejected.

3.8 METAL

3.8.1 Building Systems

3.8.1.1 Arch Span

Insulated Arch-Span metal roofing systems shall be supported by reinforced concrete stem walls approximately 2.5 m in height. Stem walls shall be insulated and finished with gypsum board or plaster on the interior, and finished with stucco on the exterior. The floor slab shall be reinforced concrete with a minimum thickness of 150mm placed on a clean vapor barrier above a capillary water barrier of 150mm minimum thickness on properly compacted soil. Exterior walls shall be insulated with a minimum of R-13 insulation, and provide a minimum of R-30 insulation for the roof. The roof insulation system shall be spray applied and harden to a durable rigid surface, as per the arch span manufacturer's standards.

Ribbed steel roof panels shall be mechanically fabricated from prefinished steel coil and joined by machines and operators, all certified by the arch span building manufacturer. The contractor shall present certificates of manufacturer's training for machine operators, and certificates of authenticity for proprietary machines and equipment.

Only prefinished steel coil certified by the arch-span system manufacturer shall be used on this project. Fasteners for accessories shall be manufacturer's standard. All materials and Concealed fasteners for steel roof panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel. Fasteners for structural connections shall provide both tensile and shear strength of not less than 350 kg per fastener.

3.8.1.2 Pre-Engineered Metal Building Systems

Metal building systems shall comply with the requirements of the MBMA Low Rise Building Systems Manual-2002. Facilities designated as long-span, shall have no interior columns.

3.8.2 Trim

3.8.2.1 Metal Window Sills

Galvanized metal window sills, 1 mm (20-gage), shall be installed on the exterior of all windows. The metal window sills shall have a turn down of 50 mm over the exterior masonry and stucco. Metal sills shall extend from side to side of the masonry opening in a single piece. Extend the metal window sill a minimum of 20 mm under the bottom of the aluminum windows. Install masonry mortar as required for a smooth surface under the window sills. Sills shall slope a minimum of 6mm to the exterior and not allow

water to puddle.

3.8.2.2 Metal Fascia & Soffit

No wood fascias and/or soffits are allowed. Use metal fascias and soffits throughout. Extend roof decking out over fascia a minimum of 20 mm. Provide a 40 mm drip flashing over edge of roof decking so that it extends past bottom of decking on all sides of the building. Provide continuous soffit venting of all overhangs at both bottom and top of roof slope.

3.8.3 Dining Facilities

3.8.3.1 Steel Cook Top

Provide steel cook top in kitchen minimum thickness of 25 mm. Provide circular cut outs. Consult with the Contracting Officer for the diameter of circular cutouts. Provide steel infill plates for all cut out openings. Cook top can be made of several pieces for ease of handling. Adjacent plates shall be tight fitting to each other.]

3.8.3.2 Pass-Through Counter Top

Provide 1.6 mm (16 gauge) stainless steel, or 40 mm marble, pass through counter tops at openings between the kitchen and dining area. Edges shall be turned down 30 mm and corners shall be welded and ground smooth. Provide anchor angles welded to the bottom of the counters to anchor tops to masonry walls below. Provide six (6) anchors on the Dish Return Counter, three (3) on each side of the wall. Provide eight (8) anchors on the Serving Counter, four (4) on each side of the wall. Anchor angles to wall with masonry expansion sleeves and stainless steel screws. Counter tops are to be 600 mm wide x length of opening shown.

3.8.3.3 Fire Counter Shutter (Dining Facilities)

Fire Counter Shutters shall be installed in conjunction with the Pass-Through Counter Tops described in the paragraph above. Fire counter shutters shall be used to separate the kitchens from the dining areas, and shall be U.L labeled for gypsum board, masonry and steel openings, and rated at 90 minutes in full compliance with NFPA-80 standards. Finish of shutter, guides and hoods shall be stainless steel. System shall be activated by 74 °C (165 °F) fusible links, and by electrical switches located near exit doors. Bottom bar sliding bolt locks shall be provided to secure the shutters in the down position; bolts shall be operated from the kitchen side of the shutter.

3.9 CARPENTRY

The use of wood framing as indicated below is acceptable only where allowed by IBC 2003 and NFPA 101.

3.9.1 Wood Purlins

If Contractor chooses to utilize wood purlins, provide and install roof purlins of natural wood, locally available material 1 meter on center securely wedged between steel H structural joists. Tightly fit 30 mm boards over roof structure and nail into wood purlins. New roofing shall extend a minimum of 300 mm past the exterior surface of the wall.

3.9.2 Wood Battens

If Contractor chooses to utilize wood ceiling batten strips, wood ceiling batten strips, 20 mm x 60 mm, shall be nailed to the bottom of the wood purlins. Battens shall be spaced at 400 mm on center (or per UBC requirements if sheetrock is substituted for plaster). This is for the support of a plaster ceiling.

3.9.3 Plywood

If the contractor chooses to utilize plywood, it must be designed and constructed in accordance with the American Plywood Association PRB-108 standard, available free of charge on their website: www.apawood.org.

3.10 ROOFING AND WEATHERPROOFING

3.10.1 Sloped Roofs

On sloping roofs provide and install .70 mm (24 gauge) galvanized steel in either corrugated or standing seam design with an asphalt impregnated membrane layer directly underneath for moisture resistance. Metal roofing shall be anchored to the steel "Z" purlins or wood deck sub-surface using exposed fasteners at 300 mm on center at all seams and at 600 mm on center in the panel field. Fasteners shall be placed at the top of the corrugation taking care not to dent panel. Roof sealant or adhesive shall be placed over each anchor head. Roofing system shall include all edge, ridge and penetration flashings necessary for a watertight installation and as described in this section. Roofing shall be galvanized mil finish. Panels shall be overlapped two corrugations side to side and be continuous sheets from ridge to eave. Provide continuous ridge vents on all gable roofs.

3.10.2 Low Slope Roofs

Provide and install 3 ply built up roofing over concrete deck. Contractor may propose to the Contracting Officer an alternate roofing system with justification for consideration and alternate pricing. Concrete roof deck shall slope 21mm per m.

3.10.2.1 Built-up Roofing System

A Insulated-Deck, Coal Tar, Glass-Fiber, Aggregate Roofing (ICGA-BUR): Provide built-up, aggregate-surfaced roof system with coal tar bitumen and glass-fiber ply felts (roof manufacturer's separation layers) for layup as indicated.

3.10.2.1.1 Primer: ASTM D 41 primer as recommended by roofing manufacturer.

3.10.2.1.2 Coal Tar Bitumen: ASTM D 450, Type III, as an option to asphalt.

3.10.2.1.3 Bitumen Membrane which meets the following:

- a. ASTM D312 or the equivalent EN 1849-1 for thickness and unit weight,
- b. ASTM D312 or the equivalent EN-1426 for penetration,
- c. ASTM D312 or the equivalent EN-1427 for softening point
- d. ASTM D312 or the equivalent TS 11758-1 for flash point or heat stability
- e. ASTM D4601 or the equivalent TS 11758-1 for width and area of roll
- f. ASTM D4601 (moisture percentage) or the equivalent EN 1928 (water tightness)
- g. ASTM D226 (pliability) or the equivalent EN 1109 (cold bending).

3.10.2.1.4 Glass Roofing Felt: ASTM D 2178, Type IV or VI, except felts for coal tar systems shall be impregnated with a bituminous resin coating which is compatible with coal tar bitumen.

3.10.2.1.5 Organic Felt Base: ASTM D 2626 for use with asphalt roofing system.

3.10.2.1.6 Organic Felt Base: ASTM D 226 for use with asphalt roofing system and ASTM D 227 for use with coal tar roofing system. Organic felts may be used for bitumen stops and edge envelopes.

3.10.2.1.7 Insulation: 5cm (2 inch) thick extruded polystyrene rigid thermal insulation boards, conforming DIN, EN 13164 BS, EN 13164, $k=0.2$ @ 75 degrees F mean temperature, 2.82 kg/sq cm (40 lbs/sq in) compressive strength, hydrophobic, Type VI.

3.10.2.2 Roof Membrane Installation

- a. Prime surface of concrete deck with asphalt primer per manufacturers recommended application rate.
- b. Cant Strips/Tapered-Edge Strips: Wood, not less than 89 mm (3-1/2 inches) high, 45-degree insulation cant strips at juncture of membrane with vertical surface. Provide tapered-edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- c. Base Layer: Install one lapped course of base sheet. Attach first layer of roofing membrane material to substrates and elsewhere as indicated. Mop to non-nailable substrate with hot bitumen or apply with torch method per manufacturer's specifications
- c. Second Layer: Install second layer of roofing membrane material over the first course staggering joints and seams in both directions by at least 300 mm. Mop top layer of membrane to base layer, or attach via torch method per manufacturer's specifications.

3.10.2.3 Insulation Installation

Comply with insulation manufacturer's instructions and recommendations for handling, installing, and bonding or anchoring insulation to substrate. Insulation boards shall be installed loose, without glue, in staggered manner. Attention should be paid not to leave separation along edges. Where overall insulation thickness is 50 mm (2 inches) or greater, install required thickness in two layers with joints of second layer offset from joints of first layer a minimum of 300 mm (12 inches) each direction. Trim surface of insulation where necessary at roof drains so completed surface is flush with drain ring. Polyester felt or geotextile shall be installed over insulation layers as a filter layer to prevent the passage of fines in gravel layer to lower strata.

3.10.2.4 Composition Flashing And Stripping

- a. Install composition flashing at cant strips, at other sloping and vertical surfaces, at roof edges, and at penetrations through roof. Install composition flashing in accordance with membrane manufacturers specifications. Nail or provide other forms of mechanical anchorage of composition flashing to vertical surfaces as recommended by manufacturer of primary roofing materials.
- b. Install composition stripping where metal flanges are set on roofing. Provide not less than two plies of woven glass-fiber fabric, each set in a continuous coating of roofing cement and extended onto the deck 100 mm to 150 mm (4 inches and 6 inches), respectively. Except where concealed by aggregate surfacing or elastic flashing, apply a heavy coating of roofing cement over composition stripping.
- c. Roof Drains: Fill clamping ring base with a heavy coating of roofing cement. Set built up roofing membrane in to the clamping ring base and fix the drain top on it.
- d. Allow for expansion of running metal flashing and edge trim that adjoins roofing. Do not seal or bond built-up roof membrane or composition flashing and stripping to metal flanges that are over 914 mm (3 feet) in length.
- e. Counterflashings: Counterflashings, cap flashings, expansion joints and similar work to be coordinated with built-up roofing work, are specified in other sections of these specifications.
- f. Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other

devices and major items of roof accessories to be coordinated with built-up roofing work.

3.10.2.5 Gravel Layer

A gravel layer of 16 to 32 mm diameter stone will be laid in at least 5cm thick on top of the filter layer in non-trafficable flat roofs. The gravel layer will be applied as soon as possible to prevent UV damage and/or wind damage to insulation and filter layers.

3.10.3 Flashing & Sheet Metal

3.10.3.1 Materials

Any metal listed by ASTM, DIN, BS or EN standards. Manual for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in ASTM, DIN, BS or EN standards. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items shall be copper.

3.10.3.2 Steel Sheet, Zinc-Coated (Galvanized)

Zinc coated steel conforming to ASTM A 525, DIN BS or EN Standards.

3.10.3.3 Aluminum wall capping and expansion joint profiles.

Aluminum wall capping shall conform to ASTM B 209 M, DIN 18339, BS or EN Standards.

3.10.3.4 Roof Gutters

Roof gutters shall be installed as indicated. Roof gutters shall be rigidly attached to the building. Supports for roof gutters shall be spaced according to manufacturer's recommendations.

3.10.3.5 Downspouts

Downspouts shall be designed and fabricated on site. Unless otherwise specified or indicated, exposed edges shall be folded back to form a 13 mm (1/2 inch) hem on the concealed side, and bottom edges of exposed vertical surfaces shall be angled to form drips. Bituminous cement shall not be placed in contact with roofing membranes other than built-up roofing. Downspouts shall be rigidly attached to the building with supports a minimum of 1.5 M apart.

3.10.3.6 Wall, Floor, Ceiling Expansion Joints In Plaster & Stucco

Expansion joints shall be provided as specified in ASTM, DIN 18339, BS or EN Standards.

3.10.3.7 Connections and Jointing

3.10.3.7.1 Soldering

Soldering shall apply to copper and stainless steel items. Edges of sheet metal shall be pre-tinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless steel to be pre-tinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

3.10.3.7.2 Seaming

Flat-lock and soldered-lap seams shall finish not less than 25 mm. wide. Unsoldered plain-lap seams shall lap not less than 75 mm. unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.10.3.7.3 Cleats

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 3 mm. apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 300 mm. on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

3.10.3.8 Flashing

Flashing shall be installed at locations indicated and as specified below. Sealing shall be according to the flashing manufacturer's recommendations. Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof and floor drains, and for electrical conduit projections through roof or walls are specified in other sections. Except as otherwise indicated, counter flashings shall be provided over base flashings. Perforations in flashings made by masonry anchors shall be installed on top of joint reinforcement. Lashing shall be formed to direct water to the outside of the system.

3.10.3.8.1 Through-wall Flashing

Through-wall flashing includes sill, lintel, and spandrel flashing. The flashing shall be laid with a layer of mortar above and below the flashing so that the total thickness of the two layers of the mortar and flashing are the same thickness as the regular mortar joints. Flashing shall not extend further in to the masonry backup wall than the first mortar joint. Joints in flashing shall be lapped and sealed. Flashing shall be one piece for lintels and sills.

3.10.3.8.2 Lintel Flashing

Lintel flashing shall extend the full length of lintel. Flashing shall extend through the wall one masonry course above the lintels and shall be bent down over the vertical leg of the outer steel lintel angle not less than 50 mm, or shall be applied over top of masonry and pre-cast concrete lintels. Bed joints of lintels at joints shall be under laid with sheet metal bond breaker.

3.10.3.8.3 Sill Flashing

Sill flashing shall extend the full width of the sill and not less than 100 mm beyond ends of sill except at joint where the flashing shall be terminated at the end of the sill.

3.10.3.8.4 Wall Capping

Wall Capping shall be installed according to the manufacturer's recommendations.

3.10.4 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool smooth fresh sealant after application to ensure adhesion. Sealant shall be uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints; apply sealant, and tool smooth as specified. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.10.4.1 Interior Sealant

ASTM C 834 or ASTM C 920, Type S or M, Grade NS, Class 12.5. Use NT, DIN, BS, or EN equal standards.

3.10.4.2 Exterior Sealant

For joints in vertical and horizontal surfaces, provide ASTM C 920, Type S or M, Grade NS, DIN, BS, or EN equal standards.

3.10.4.3 Floor Joint Sealant

(ASTM C 920) Type S or M, Grade P, class 25, use T

3.10.4.4 Primers

Provide a non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

3.10.4.5 Bond Breakers

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

3.10.4.6 Backing

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated.

3.10.4.7 Cleaning Solvents

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

3.10.4.8 Surface Preparation

Surfaces shall be clean, dry to the touch, and free from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

3.10.4.9 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.10.4.10 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified.

3.10.4.11 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

3.10.4.12 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

- a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.
- b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

3.11 WINDOWS, DOORS & GLAZING

3.11.1 Windows

3.11.1.1 Materials

- (a) Aluminum Extrusions: Provide alloy and temper recommended by the window manufacturer for the strength, corrosion resistance, and application of required finish, meeting the DIN 1725 raw material requirements, but not less than 215 N/mm² ultimate tensile strength and not less than 1.5 mm thick at any location for main frame and sash members.
- (b) Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard non-corrosive pressed-in splined grommet nuts.
 - 2. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.
- (c) Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of DIN 1748; provide sufficient strength to withstand design pressure indicated. As a minimum provide 3 anchors on each side of the frame.
- (d) Compression-Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at the manufacturer's option, provide compressible stripping for glazing and weatherstripping such as

molded EPDM or neoprene gaskets.

- (e) Sealant: For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic non-shrinking, and non-migrating. Comply with Sealants of these specifications for selection and installation of sealants.
- (f) Wire Fabric Insect Screen shall be permanently fixed to the exterior, except for guard towers.

3.11.1.2 Hardware

A. General: Provide the manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

3.11.1.3 Fixed, Casement, Projected and Horizontal Sliding Windows

Provide window units meeting UL 752, level 5, AK-47 resistance.. This standard shall apply to all window units within guard shack, guard house, guard tower, and guard rooms in Headquarters Building. Provide cam action sweep sash lock and keeper at meeting rails. All other glazing shall be minimum 6mm laminated with .75mm polyvinyl-butyl (PVB) interlayer per UFC 4-010-01.

3.11.1.4 Fabrication

Provide horizontally sliding aluminum windows with factory finish in all buildings to fit the masonry openings. Window openings shall be provided with insect screening permanently fixed to the exterior. Provide a locking device on the interior of each window. Provide anchors on each side of the frame into the adjoining masonry, 3 on each side. Provide weather stripping system for all exterior windows and doors.

3.11.1.5 Finishes

Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

- (a) Color: White meeting the requirements of DIN 50018

3.11.1.6 Inspection

Inspect openings before beginning installation. Verify that rough or masonry opening is correct and the sill plate is level. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.

3.11.1.7 Installation

Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of the work. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place. Set sill members and other members in a bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction. Refer to the Sealant sections for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

3.11.1.8 Adjusting

Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.

3.11.1.9 Cleaning

Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

3.11.2 Doors

All exterior doors (entry and exist doors) shall be heavy duty metal doors with metal frames. Interior door shall be hollow metal doors with hollow metal frames. All glazed doors shall have 5 mm single glazing in the upper half of the door. Heavy gauge metal exterior doors are required for security of unmanned buildings, such as water treatment building, power station, warehouses, and other buildings requiring higher security. Commercial duty lock sets and hardware shall be used on all doors. Install required louvers, as called for in paragraph 6, in the lower portion of the door. Provide (3) hinges on all doors. Hinges shall be the 5 knuckle type or equivalent. Provide door handles and locksets that can be locked with a key on all doors. All door locks shall have a thumb latch on inside of door such that no key is necessary to exit the room or building. Coordinate the final keying schedule with Contracting Officer prior to ordering lock sets. Generally each building should have 8 master keys fitting all locks, 8 sub-master keys fitting all exterior doors and 3 keys each for each interior door. Include 25% spare key blanks for the amount of keys provided per building. Provide numbering system identifying key to associated room door. All glazing in or adjacent to doors shall be tempered per IBC. Provide weather stripping system for all exterior doors.

Fire rated doors are required in this project as follows: DFAC kitchen/dining wall requires a 90 minute rated door, storage and utility rooms require 45 minute rated doors and in the admin area, the corridor doors require 20 minute rated doors. The corridor doors in the healthcare portion of the facility do not require fire rated doors but do require smoke barrier doors in the corridor. Such smoke barrier doors require a two way swing with 0.65 SM (100 sq inch) vision panels in each door leaf. Follow the requirements in the NFPA 80 referenced standard.

3.11.2.1 Solid Plastic & Phenolic doors

Solid Plastic & Phenolic doors and frames are for interior wet room use only. Solid Plastic & Phenolic doors and frames be used for bathrooms, shower rooms, and toilets rooms.

3.11.2.2 Steel Doors

SDI A250.8, except as specified otherwise. Prepare doors to receive specified hardware. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 44.5 mm thick, unless otherwise indicated. Doors shall be constructed using heavy gauge steel with minimum thickness of 1.2 mm.

3.11.2.2.1 Accessories

3.11.2.2.1.1 Interior Louvers

SDI 111-C, Louvers shall be stationary sight-proof or lightproof type as required. Louvers for lightproof doors shall not transmit light. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 0.9 mm thick steel and louver blades of a minimum 0.6 mm. Louvers for lightproof doors shall have minimum of 20 percent net-free opening. Sight-proof louvers shall be inverted "V" blade design with minimum 55 or inverted "Y" blade design with minimum 40 percent net-free opening.

3.11.2.2.1.2 Exterior Louvers

Louvers shall be inverted "Y", "V" or "Z" type. Weld or tenon louver blades to continuous channel frame and weld assembly to door to form watertight assembly. Form louvers of hot-dip galvanized steel of same gage as door facings. Louvers shall have steel-framed insect screens secured to room side and readily removable. Provide aluminum wire cloth, 7 by 7 per 10 mm or 7 by 6 per 10 mm mesh, for insect screens.

3.11.2.2.1.3 Astragals

Provide overlapping steel astragals on pairs of exterior steel doors which will not have aluminum astragals or removable mullions. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

3.11.2.2.1.4 Moldings

Provide moldings around glass of interior and exterior doors. Provide non-removable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Moldings shall interlock at intersections and shall be fitted and welded to stationary moldings.

3.11.2.2.2 Standard Steel Frames

SDI A250.8, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners or knock-down field-assembled corners. Provide steel frames for doors, transoms, sidelights, mullions, cased openings, and interior glazed panels, unless otherwise indicated.

3.11.2.2.2.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

3.11.2.2.2.2 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and shall member with heads and jambs butt-welded thereto or knock-down for field assembly. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

3.11.2.2.2.3 Stops and Beads

Form stops and beads from 0.9 mm thick steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 300 to 400 mm on centers; miter molded shapes at corners; butt or miter square or rectangular beads at corners.

3.11.2.2.3 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, anchors not lighter than 1.2 mm thick.

3.11.2.2.3.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 2285 mm in height,

provide one additional anchor for each jamb for each additional 760 mm or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 5 mm diameter steel wire, adjustable or T-shaped;
- b. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts

3.11.2.2.3.2 Floor Anchors

Provide floor anchors drilled for 10 mm anchor bolts at bottom of each jamb member. [Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

3.11.2.2.4 Fire and Smoke Doors and Frames

The requirements of NFPA 80 and NFPA 105 respectfully shall take precedence over details indicated or specified.

3.11.2.2.5 Weather-stripping, Integral Gasket

Black synthetic rubber gasket with tabs for factory fitting into factory slotted frames, or extruded neoprene foam gasket made to fit into a continuous groove formed in the frame, may be provided in lieu of head and jamb seals. Insert gasket in groove after frame is finish painted.

3.11.2.2.6 Hardware Preparation

Provide minimum hardware reinforcing gages as specified in ANSI A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI A250.8 and ANSI A250.6. For additional requirements refer to BHMA A115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of SDI A250.8, as applicable. Punch door frames, with the exception of frames that will have weather-stripping or lightproof or soundproof gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

3.11.2.2.7 Finishes

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in SDI A250.8, or paintable A25 galvanized steel without primer. Where coating is removed by welding, apply touchup of factory primer.

3.11.2.2.8 Fabrication and Workmanship

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 3 mm larger than the actual masonry thickness. Design other frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive calking compound.

3.11.2.2.9 Installation of Doors & Frames

3.11.2.2.9.1 Frames

Set frames in accordance with SDI 105. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Backfill frames with mortar. When an additive is provided in the mortar, coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

3.11.2.2.9.2 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

3.11.2.2.9.3 Doors

Hang doors in accordance with clearances specified in SDI A250.8. After erection and glazing, clean and adjust hardware.

3.11.2.2.9.4 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

3.11.2.2.9.10 Protection and Cleaning

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat. Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

3.11.2.3 Wood Doors and Frames

Provide doors that are wood, solid core, 900/1000/1100/1200 mm. Wide x 2200 mm. High x 45 mm. Thick with steel frame to match new door masonry openings. All glazed doors shall have 5 mm. single tempered glazing

3.11.2.3.1 Accessories

3.10.2.5.1.1 Door Louvers

Fabricate from wood and of sizes indicated. Louvers shall be of the manufacturer's standard design and shall transmit a minimum of 35 percent free air. Louvers shall be the slat type. Toilet rooms and utility rooms require door louvers.

3.11.2.3.1.1 Door Lite Openings

Provide glazed openings with the manufacturer's standard wood moldings except that moldings for doors to receive natural finish shall be of the same species and color as the face veneers. Moldings for flush doors shall be lip type.

3.11.2.3.1.2 Weather Stripping

Provide weather-stripping that is a standard cataloged product of a manufacturer regularly engaged in the

manufacture of this specialized item. Weather stripping shall be looped neoprene or vinyl held in an extruded non-ferrous metal housing. Air leakage of weather stripped doors shall not exceed 0.003125 cubic meter per second of air per square meter of door area when tested in accordance with ASTM E 283.

3.11.2.3.2 Pre-fitting

At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, beveled edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

3.11.2.3.3 Finishes

Provide door finish colors as selected by the Contracting Officer from the color selection samples.

3.11.2.3.4 Water-Resistant Sealer

Provide a water-resistant sealer compatible with the specified finish as approved and as recommended by the door manufacturer.

3.11.2.3.5 Installation

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 2 mm minimum, 3 mm maximum clearance at sides and top, and a 5 mm minimum, 6 mm maximum clearance over thresholds. Provide 10 mm minimum, 11 mm maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 3 mm in 50 mm. Door warp shall not exceed 6 mm when measured in accordance with WDMA I.S. 1-A.

Install doors in strict accordance with the manufacturer's printed instructions and details. Provide weather stripping on exterior swing-type doors at sills, heads and jambs to provide weather tight installation. Apply weather stripping at sills to bottom rails of doors and hold in place with a brass or bronze plate. Apply weather stripping to door frames at jambs and head. Shape weather stripping at sills to suit the threshold.

3.11.2.4 Overhead Coiling Doors

Doors shall be fabricated from interlocking cold-rolled slats, designed to withstand building wind loading and be installed with wind locks. Slat shall be continuous for the width of the door. For doors not exceeding 4.27 m, slats shall be flat-profile design, with a depth of not less than 15.9 mm, a center to center width not more than 69.9 mm, and not less than a 1.21 mm uncoated thickness. Provide weather stripping for door-head and door jamb guides, and a bottom astragal. Weather stripping and astragal shall be natural rubber or neoprene rubber. Curtain jamb guides shall be fabricated from a combination of steel angles of sufficient size to retain curtain against the specified wind. Guides shall be fabricated from structural quality steel angles. Door shall have manufacturer's standard five pin tumbler locks; keyed. Doors shall be counterbalanced by an adjustable, steel, helical torsion spring mounted around a steel shaft in a spring barrel and connected to the door curtain with the required barrel rings. Hoods shall be fabricated from steel sheets with minimum yield strength of 227.5 MPa.

Counterbalance-barrel components shall be as follows:

- (a) Spring barrels shall be hot-formed structural-quality carbon steel, welded or seamless pipe. Pipe shall be of sufficient diameter and wall thickness to limit deflection to a maximum of 1/360 of the

span.

- (b) Counterbalance springs shall be oil-tempered helical steel springs designed with a safety factor of 4. Springs shall be sized to counterbalance the weight of the curtain at any point of its travel, and shall be capable of being adjusted to counterbalance not less than 125% of the normal curtain load. Spring adjustment shall be arranged in such a way that the curtain need not be raised or lowered to secure the adjustment.
- (c) Counterbalance shafts shall be case-hardened steel of the proper size to hold the fixed ends of the spring and carry the torsion load of the spring.
- (d) Barrel plugs shall be fabricated from cast steel machined to fit the ends of the barrel. Plugs shall secure the ends of the spring to the barrel and the shaft.
- (e) Barrel rings shall be fabricated from malleable iron of the proper involute shape to coil the curtain in a uniformly increasing diameter.
- (f) Shaft bearings shall be factory sealed ball bearings of the proper size for load and shaft diameters.
- (g) Door operators shall consist of an endless steel hand chain, chain-pocket wheel and guard, and a geared reduction unit of at least a 3:1 ratio. Required pull for operation shall not exceed 16 kg. Chain hoists shall have a self-locking mechanism allowing the curtain to be stopped at any point in its upward/downward travel and to remain in that position until moved to the fully open or closed position. Hand chains shall be cadmium-plated alloy steel with a yield point of at least three times the required hand-chain pull. Pretreated zinc-coated steel sheets shall be given the manufacturer's standard prime coat and an enamel finish coat applied to the exterior face after forming.
- (h) After installation, doors, track, and operating equipment will be examined and tested for general operation and weather against the specified wind pressure, and weather resistance. Doors that fail the required tests shall be adjusted and retested. Doors that have been adjusted and fail subsequent tests shall be removed and replaced with new doors at no additional cost.

3.11.3 Glass & Glazing

Glazing shall conform to ASTM C 1036 or ASTM C 1172 or equal.

3.11.3.1 Tempered Glass

Tempered glass shall be kind FT fully tempered flat type. Class 1 clear, condition A uncoated surface, Quality q3-glazing select, conforming to ASTM, DIN, BS or EN standards. Color shall be clear.

3.11.3.2 Laminated Glass

Laminated glass shall be constructed out of two, 3mm glass panes bonded together with a minimum .75mm polyvinyl-butylal (PVB) interlayer.

3.11.3.3 Insulated Glass

All exterior glazing shall be insulated, constructed of two panes of laminated glass separated by hermetically sealed 12mm airspace.

3.11.3.4 Glazing Accessories

3.11.3.4.1 Sealant

Sealant shall be elastomeric conforming to ASTM, DIN, BS, or EN standards. Type S or M, Grade NS, Class 12.5, Use G, of type chemically compatible with setting blocks, preformed sealing tape and sealants used in manufacturing insulation glass. Color of sealant shall be as selected from manufacturer's full range of standard colors by Contracting Officer.

3.11.3.4.2 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners.

3.11.3.4.3 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM, DIN, BS, or EN standards.

3.11.3.4.4 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM, DIN, BS, or EN standards.

3.11.3.4.5 Putty and glazing Compound

Glazing compound shall conform to ASTM, DIN, BS, or EN standards for face-glazing metal sash. Putty shall be linseed oil type conforming to DIN, BS, or EN standards for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

3.11.3.4.6 Setting and Edge Blocking

Neoprene setting blocks shall be dense extruded type conforming to ASTM, DIN, BS, or EN standards. Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer.

3.11.3.4.7 Preparation

Openings and framing systems scheduled to receive glass shall be examined for compliance with glass manufacturer's recommendations including size, squareness, offsets at corners, presence and function of weep system, face and edge clearance requirements and effective sealing between joints of glass-framing members. Detrimental materials shall be removed from glazing rabbet and glass surfaced and wiped dry with solvent. Glazing surfaces shall be dry and free of frost.

3.11.3.4.8 Installation

Glass and glazing work shall be performed in accordance with, glass manufacturer's instructions and warranty requirements. Glass shall be installed with factory labels intact and removed only when instructed. Edges and corners shall not be ground, nipped or cut after leaving factory. Springing, forcing or twisting of units during installation will not be permitted.

3.11.3.4.9 Cleaning

Upon completion of project, outside surfaces of glass shall be washed clean and the inside surfaces of glass shall be washed and polished in accordance with glass manufacturer's recommendations.

3.11.3.5 Protection

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth, or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

3.12 FINISHES

All finishes, colors and materials in existing building and new buildings shall match. See Section 01335 for color submittals required. Provide color boards with all materials for COR approval prior to ordering materials.

3.12.3 Exterior Walls

The exterior of all buildings shall be stucco and/or plaster conforming to ASTM C926. A temperature of between 4 and 27 degrees C shall exist for a period of not less than 48 hours prior to application of plaster and for a period of at least 48 hours after plaster has set. Control joints shall be designed for expansion and contraction of plaster work due to thermal exposure. Control joints shall comprise of back to back casing beads. Install new stucco in 2 coats. The first coat shall be a scratch coat approximately 1 cm thick. Allow 7 days to cure. The second coat shall be finish stucco, smooth finish, approximately 1 cm thick. Allow 7 days to cure before painting. Stucco showing over sanding, cracks, blisters, pits, checks, discoloration or other defects is not acceptable. Defective plaster work shall be removed and replaced with new plaster at the expense of the Contractor. Patching of defective work will be permitted only when approved by the Contracting Officer. Patching shall match existing work in texture and color. All exterior color finish shall be integral with the stucco finish. No painted stucco shall be permitted due to minimize future maintenance. Color to be selected by the Contracting Officer from the color board provided by the Contractor.

3.12.4 Interior Walls

Interior walls, either concrete or CMU block, shall be plaster applied in a similar manner as exterior stucco. Paint with 2 coats of semi-gloss off-white with less than .06% lead by weight color to be selected by the Contracting Officer from the color board provided by the Contractor. All walls in this facility shall be either reinforced concrete or CMU block wall.

3.12.5 Interior Ceilings

Ceilings of Admin and Hospital areas shall be plaster applied in 2 coats over wire mesh, which is to be stapled to the 20 mm x 60 mm wood battens. Paint ceiling with 2 coats of flat white, with less than .06% lead by weight. Gypsum board may be used in lieu of plaster but framing supports for Gypsum board shall be as follows: For ½" thick gypsum board structural fastener supports shall be not further apart than 400 mm. If gypsum board is thicker follow guidelines in ASTM C 840 for supports and fastener frequency. Wet areas such as toilet spaces shall have waterproof finishes.

3.12.5.1 Ceilings of Dining Facility shall be exposed concrete painted with 2 coats of flat white, with less than .06% lead by weight. All ceiling surfaces shall have waterproof ceilings.

3.12.6 Exposed Exterior Steel trim, Frames, Doors and Pipe Railings

Paint with one coat oil-based primer, with 2 coats of oil-based alkyd gloss enamel, color to be selected by the Contracting Officer from the color board provided by the Contractor.

3.12.7 Exposed Wood Trim, Frames and Doors

Paint with one coat oil-based primer, 2 coats of gloss enamel, color to be selected by the Contracting Officer from the color board provided by the Contractor

3.12.8 Tile Work

Tile work shall not be performed unless the substrate and ambient temperature is at least 10 degrees C and rising. Temperature shall be maintained above 10 degrees C while the work is being performed and for at least 7 days after completion of work. Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Acid shall not be used for cleaning glazed tile. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer. After the grout has set, tile wall surfaces shall be given a protective coat of a non-corrosive soap or other approved method of protection.

3.12.8.1 Floors in wet areas shall be ceramic tile with thin set mortar. Joints shall be 2-3 mm. Waterproof gray grout shall be applied the full depth of the tile. Floors shall slope, minimum 1/50, to floor drains. Slope shall be obtained with sloping mortar bed of minimum 20 mm thickness. Provide continuous waterproofing membrane beneath sloping mortar bed, turn up wall 300 mm behind wall base. Membrane shall be fully sealed at joints and shall shed water into body of floor drain. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

3.12.8.2 Floors in administration areas, hospital area, DFAC dining and kitchen, corridors, and all rooms unless otherwise stated shall be **300 mm x 300 mm terrazzo tile with thin set mortar**. All storage and utility room floor finishes shall be sealed concrete. Joints shall be 2-3 mm. Waterproof gray grout shall be applied the full depth of the tile. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

3.12.8.3 Walls in wet areas shall be tiled with 150 mm x 150 mm glazed ceramic tile up to 2 meters above the floor to include interior of toilet stalls, showers and behind sinks. Joints shall be 2-3 mm. Waterproof gray grout shall be applied full depth of the tile. Grout shall cure for 72 hours and then be sealed with a commercial grout sealant in two coats. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

3.12.8.4 Kitchen in Dining Facility shall be covered with terrazzo flooring] **concrete**. Walls in kitchen shall be ceramic tile up to 2 m above finished floor. Floor in Dining area shall be terrazzo tile.

3.12.9 All other floors are to be completely cleaned and sealed epoxy. Color to be selected by the Contracting Officer from samples provided by the Contractor.

3.13 SPECIALTIES

3.13.1 Mirrors

0.6 m x 0.9 m, 6 mm plate glass shall be mounted above all lavatories. Mount bottom of mirrors 1.1m above finished floor.

3.13.2 Toilet Paper Holders

Toilet paper holders, stainless steel, shall be installed approximately 200 mm above floor in Eastern Toilets.

3.13.3 Shower Curtain Rods & Shower Curtain

Shower curtain rods, stainless steel, heavy duty, 18 gauge shall be mounted between the screen walls of each shower stall. Mount rod at 2.0 m above finished floor. Provide a shower curtain with support rings for each shower stall.

3.13.4 Grab-Bars for HDCP and Patient Toilet rooms

Stainless steel grab-bars, heavy duty, 18 gauge, two each 900 mm and 1050 mm long, 40 mm diameter shall be mounted behind and beside all eastern toilets, and bathtubs as they occur.

3.13.5 Paper Towel Dispensers

Paper towel dispensers, 0.683 mm Type 304 stainless steel, surface mounted. Furnish tumbler key lock locking mechanism.

3.13.6 Light Duty Metal Shelf

Provide a 600 mm long, light duty stainless steel shelf and brackets over each lavatory.

3.13.7 Robe Hooks

Robe hooks on all toilet and shower stalls required.

4.0 STRUCTURAL

4.1 GENERAL

The project consists of various structures. The new buildings shall be provided with a reinforced concrete slab foundation that is properly placed on suitable compacted ground area and shall be in accordance with the recommendations from the geotechnical investigation. The reinforced concrete foundation shall be designed by the Contractor. Building foundations shall be founded a minimum of 800 mm below grade.

4.2 DESIGN

Design shall be performed and design documents signed by a registered professional architect and/or engineer. Calculations shall be in SI (metric) units of measurements. All components of the building shall be designed and constructed to support safely all loads without exceeding the allowable stress for the materials of construction in the structural members and connections. All building exterior walls shall be constructed with reinforced CMU, shotcrete 3-D panels, or reinforced concrete unless otherwise stated in sections 1010 or 1015.

4.3 STANDARDS

The Contractor should use the following American standards to provide sound structural design if local standards are not available, relevant, or applicable. The Contractor shall follow American Concrete Institute Standards for design and installation of all concrete structures.

Concrete	28 MPa (f'c) (4,000psi) minimum specified compressive strength @ 28 days (ASTM-. C 39 and ACI 318) with a maximum water-cement ratio of 0.45.
Plaster strength	140.0 kg./sq.cm (f'c) (2,000psi) conforming to ASTM C 926.
Steel Reinforcement	4218.0 kg./sq.cm (Fy= 60.0 ksi),yield strength.
Welded Wire Fabric	ASTM A185

Anchor Bolts	ASTM A307 using A36 steel.
Concrete Masonry Units	ASTM C90, Type I (normal wt, moisture Cntrl).
Mortar	ASTM C270, Type S (Ultimate compressive strength of 130.0kg/sq. cm.)
Proportion	1 part cement, 0-1/2 part lime and 4-1/2 parts aggregate
Grout	ASTM C476 (Slump between 200 mm to 250) and Compressive Strength 14 MPa (2,000 psi) at 28 days.
Joint Reinforcement	Standard 9 gauge minimum, Ladder Type
Structural Steel	ASTM A36: 250 MPa (Fy = 36,000psi)
Welding	AWS (American Welding Society) D1.1-2002.

4.4 DEAD AND LIVE LOADS

Dead loads consist of the weight of all materials of construction incorporated in the buildings. Live loads used for design shall be in accordance with the Structural Load Data, UFC-3-310-01, and edition as referenced herein.

4.5 WIND LOADS

Wind loads shall be calculated using a "3-second gust" wind speed of 135 km/hr.

4.6 SEISMIC

The building and all parts thereof shall be designed for the seismic requirements as defined by the International Building Code referenced herein. Spectral ordinates shall be $S_s = 1.28g$ and $S_1 = 0.51g$.

4.7 STRUCTURAL CONCRETE

Concrete structural elements shall be designed and constructed in accordance with the provisions of the American Concrete Institute, Building Code Requirements for Structural Concrete, ACI 318, referenced edition. A minimum cylinder 28 day compressive strength of 28 MPa (4,000 psi) shall be used for design and construction of all concrete, except that 24 MPa (3500 psi) shall be used for Shotcrete applications. Reinforcing steel shall be deformed bars conforming to American Society for Testing and Materials (ASTM) publication ASTM A 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement. Concrete at or below grade shall have maximum water-cement ration of 0.45. No concrete shall be placed when the ambient air temperature exceeds 32 degrees C (90 degrees F) unless an appropriate chemical retardant is used. In all cases when concrete is placed at 32 degrees C (90 degrees F) or hotter it shall be covered and kept continuously wet for a minimum of 48 hours. Concrete members at or below grade shall have a minimum concrete cover over reinforcement of 75 mm (3 inch).

4.8 MASONRY

Masonry shall be designed and constructed in accordance with the provisions of Building Code Requirements for Masonry Structures, ACI 530/ASCE 5/TMS 402, latest editions. Mortar shall be Type S and conform to ASTM C 270, latest edition. Masonry shall not be used below grade, unless for fully grouted and reinforced foundation stem walls. **All cells of CMU walls shall be fully grouted and reinforced. All fire rated walls in this project shall be CMU wall construction as follows: 1 hour rating = 100 mm CMU wall and 2 hour rating = 200 mm CMU wall.**

4.9 STRUCTURAL STEEL

Structural steel shall be designed and constructed in accordance with the provisions of American Institute of Steel Construction (AISC), Specifications for Structural Steel Buildings, 9th Edition. Design of cold-formed steel structural members shall be in accordance with the provisions of American Iron and Steel Institute (AISI), Specifications for Design of Cold-Formed Steel Structural Members.

4.9.1 Steel Roof Joists

Steel roof joists shall be placed according to the roof design and roof manufacturer specifications. Steel purlins shall be installed perpendicular to the steel beams. Use continuous metal roof sheets from ridge to eave to avoid constructing roof seams. In lieu of the continuous metal roof sheets, the Contractor can submit a plan for roofing seams; however, the plan must show a detail of how leaks will be avoided, and the Contracting Officer before application must approve the plan. Steel "hat channels" shall be installed on the bottom side of steel beams for the installation of gypsum board with screws. Provide all necessary metal framing for roof fascia and soffits. See structural paragraph for structural characteristics of steel joists.

4.10 METAL DECK

Deck units shall conform to SDI Publication Number 29. Panels of maximum possible lengths shall be used to minimize end laps. Deck units shall be fabricated in lengths to span three or more supports with flush, telescoped or nested 50 mm (2 inch) laps at ends, and interlocking, or nested side laps. Metal deck units shall be fabricated of steel thickness required by the design and shall be galvanized.

4.11 OPEN WEB STEEL JOIST

Open web steel joists shall conform to SJI Specifications and Tables. Joists shall be designed to support the loads given in the standard load tables of SJI Specifications and Tables.

4.12 FOUNDATIONS

Foundations shall be in accordance with the Geotechnical requirements of this RFP.

4.13 EARTHWORK AND FOUNDATION PREPARATION

4.13.1 Capillary Water barrier

ASTM C 33 fine aggregate grading with a maximum of 3 percent by weight passing ASTM D 1140, 75 micrometers, No. 200 sieve, or 37.5mm and no more than 2 percent by weight passing the 4.75mm No. 4 size sieve and conforming to the soil quality requirements specified in the paragraph entitled "Satisfactory Materials."

4.13.2 Satisfactory Materials

Any materials classified by ASTM D 2487 as GW, GW-GM, GW-GC, SW, SM, SW-SM, SC, SW-SC and CL-ML free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

4.13.3 Unsatisfactory Materials

Any materials which do not comply with the requirements set forth in the Satisfactory Materials paragraph. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 75mm. The Contracting Officer shall be notified of any unsatisfactory materials.

4.13.4 Clearing and Grubbing

Unless indicated otherwise, remove tress, stumps, logs, shrubs, brush and vegetation, and other items that would interfere with construction operations within lines 1.5 meters outside of the building and

structure line. Remove stumps entirely. Grub out matted roots and roots over 50mm in diameter to at least 460mm below existing surface.

4.13.5 Stripping

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be stockpiled and used for backfilling. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

4.13.6 Excavation and Compaction of Fill

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with satisfactory material and compact to at least 95 percent of the maximum dry density, as determined by the Modified Proctor laboratory procedure. ASTM D 1557 shall be used for producing the Modified Proctor moisture-density curve, unless the soil to be compacted includes more than 30% retained on the 19 mm (3/4") sieve. In this case, the Contractor must replace the ASTM D 1557 laboratory compaction procedure with AASHTO T 180, Method D, corrected with AASHTO T 224.

During compaction, the moisture content of the soil shall be within 1.5 percent of the optimum moisture content, as determined by the Modified Proctor laboratory procedure. The thickness of compacted lifts shall not exceed 15 cm and the dry density of each compacted lift shall be tested by either sand cone (ASTM D 1556) or nuclear gage (ASTM D 2292). If the nuclear gage is used, it must first be compared to sand cone tests for each soil type to verify the accuracy of the nuclear gage measurements for moisture content, wet density, and dry density. Furthermore, every tenth nuclear gage test must be accompanied by a sand cone test and these verification data must be summarized and submitted to the Contracting Officer. Density tests shall be performed at a frequency of not less than one test for each 200 square meters and not less than two tests per compacted lift.

4.13.7 Structures with Spread Footings

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Fill over excavations with concrete during foundation placement.

5.0 GEOTECHNICAL

5.1 SOIL INVESTIGATION

Existing geotechnical information is not available at the project site. Any site-specific geotechnical data required to develop foundations, materials, earthwork, and other geotechnical related design and construction activities for this project shall be the Contractor's responsibility. The Contractor shall develop all pertinent geotechnical design and construction parameters by appropriate field and laboratory investigations and analyses. The Contractor shall produce a detailed geotechnical report containing field exploration and testing results, laboratory testing results (particle sizes and distribution, liquid and plastic limit test, and moisture and density test, etc.). Information in the report shall include, but not limited to: existing geotechnical (e.g. surface and subsurface) conditions, location of subsurface exploration logs on site plan, exploration point, allowable soil bearing capacity and foundations recommendations, bearing capacity, pavement design criteria (e.g. CBR values, K values), ground-water levels, and construction

materials (e.g. concrete cement, asphalt, and aggregates). Two copies of the detailed geotechnical report shall be submitted to the Contracting Officer.

1.1.1.1.

5.2 GEOTECHNICAL QUALIFICATIONS

A geotechnical engineer or geotechnical firm responsible to the Contractor shall develop all geotechnical engineering design parameters. The geotechnical engineer or geotechnical firm shall be qualified by: education in geotechnical engineering; professional registration; and a minimum of ten (10) years of experience in geotechnical engineering design.

6.0 MECHANICAL

6.1 GENERAL

The work covered by this section consists of design, supply, fabrication and installation of new building heating, ventilation and air-conditioning (HVAC) systems. It also includes the delivery to site, erection, setting to work, adjusting, testing, balancing and handing over in perfect operating and running condition all of the HVAC equipment including all necessary associated mechanical works.

6.2 SPECIALIST SUB-CONTRACTORS QUALIFICATIONS

The heating, ventilation, and air-conditioning works shall be executed by an air-conditioning specialist sub-contractor experienced in the design and construction of HVAC equipment for a conventional compression systems, in satisfying the specified indoor design conditions. The HVAC heating and cooling load calculations shall be prepared using recognized HVAC load analysis programs such as Trane "Trace" or Carrier "HAP". The heating and cooling load calculations shall take into account the site elevation and ambient design temperatures when determining required HVAC equipment capacities and airflows. The HVAC specialist shall submit the complete HVAC analysis at the 65% design submittal. The HVAC analysis shall clearly state what type of systems are to be used and how the system will satisfy the specified indoor design conditions. Provide related psychrometric charts showing the air wet bulb and dry bulb temperatures at each section of the heat/cool unit during both design heating and cooling operation.

Provide complete, edited specifications using the UFGS specs for selected HVAC system. The edited specifications shall be submitted along with the 65% design submittal. The specifications shall be coordinated with the manufacturer of the evaporative cool/heat units.

6.3 CODES, STANDARDS AND REGULATIONS

The equipment, materials and works covered under the heating, ventilation and air-conditioning services shall conform to the referenced standards, codes and regulations where applicable except where otherwise mentioned under each particular clause.

6.4 DESIGN CONDITIONS

Outside Design Conditions **(Contractor shall verify the ambient conditions with available and reliable local weather data).**

Mazar-e-Sharif area:

Latitude – (approx.) 36 deg. North

Longitude – (approx.) 67 deg. East

Elevation – (approx.) 391 M (1284 ft.)

Summer – 37.8 deg C (100 deg F) Dry Bulb (DB)] [& 20.5 deg C (69 deg F) Wet Bulb (WB)

Winter – (0 deg C / 32 deg F)

Daily Range – data unknown)

6.4.1 Indoor Design Condition

Hospital Admin Area	Cooling 25.6 C (78 F), Heating 20 C (68 F)
DFAC Dining Area	Cooling 25.6 C (78 F), Heating 20 C (68 F)
DFAC Kitchen	Cooling 27.8 C (82 F), Heating 20 C (68 F)
Bathroom/Shower rooms	Cooling 25.6 C (78F), Heating 20 C (68 F)

6.4.2 Noise Level

Noise levels inside occupied spaces generated by HVAC systems shall not exceed NC 35

6.4.3 Internal Loads

- Occupancy: Use ASHRAE standards to calculate sensible and latent heat from people. In general, light/moderate office work is 73watts sensible and 45watts latent.
- Lighting: 21.5 W/m² (2 W/Ft²) maximum (however lighting levels shall meet minimum requirements and shall be accounted for in the heating and cooling loads based on the actual lighting design).
- Outdoor Air: Outdoor ventilation air shall be provided per International Mechanical Code. In general this requires 20 CFM/person (9.5 liters/second/person); Latrine/Bathroom Exhaust– 85 CMH (50 CFM) per toilet, urinal, and shower head.
- Building Pressurization: 1.3 mm W.G. (0.05 in W.G.); Maintain negative pressure in latrine areas.

6.4.4 Thermal Performance

External building assemblies shall meet the requirements of TI-800, Design Criteria, UFC 3-400-01 Design: Energy Conservation, and ASHRAE Standard 90.1, latest editions, but shall meet the following minimum requirements:

Assembly	Minimum Thermal Insulation Resistance Value (R-value)
Exterior walls (above grade)	RSI 1.936 (R 13)
Ceilings/roof	RSI 3.345 (R 30)
Floor (over unheated space)	RSI 3.345 (R 19)
Exterior doors	RSI 0.25 (R 1.43)
Exterior windows/(glazing within doors)	RSI 0.308(R 1.75)

RSI is measured in m²-K/W; R is measured in sqft-F-hr/BTU. The design analysis shall include exterior building assembly R-value calculations for each separate assembly. The calculations shall be in accordance with ASHRAE Fundamentals or EN ISO 6946. The calculations shall indicate the thermal conductivity, thickness, and R-value of each assembly component and the overall R-value for the assembly. The assembly R-value calculations shall investigate the effects of thermal bridging from the use of metal building material such as metal wall studs, roof purlins, wire mesh wall ties or bolts, structural members, etc.

Window glazing surface area shall be determined based on the architectural design per each building and shall not be an assumed percentage of the wall area.

6.5 NEW AIR CONDITIONING & HEATING EQUIPMENT

Environmental control of the facilities shall be achieved by HVAC equipment as listed below and approved by the U.S. Government. Unless otherwise noted, the Contractor may choose any combination of equipment to achieve the inside design conditions specified for the floor plans that is the most Life Cycle Cost Effective to the government. As a general rule, buildings over 250 SM qualifies for evaporative heat/cool units. Contractor shall size and select equipment based on equipment manufacturer's performance data at the project site elevation and ensures the equipment's performance meets the design heating and cooling sizing requirements.

Facility Type	Cooling	Heating	Type of HVAC System	Remarks
Admin Area	25.6C 78 F	20C 68 F	Central ducted forced air system	
Bathroom/Shower/Laundry	27.8C 82 F	20C 68 F	Central ducted forced air system	
Storage	29.4C 85 F	12.8C 55 F	Electric heater	
DFAC Dining	25.6C 78 F	20C 68 F	Central ducted forced air system	

6.5.1 Unitary Ducted Heat Pump Units

Ducted heat pump units shall be unitary in design and factory manufactured ready for installation. Heat pump units shall provide cooling during summer and heating during winter. The unit shall consist of DX evaporator cooling coil, blower, supplemental electric heater elements, washable filter, and condenser unit containing the compressor, condenser coil, fans and all internal controls/fittings complete all mounted in a weatherized housing finished for exposed installation. The unit shall be mounted on steel supports or on a concrete pad. Copper refrigerant suction and liquid piping shall be sized, insulated and installed in accordance to unit manufacture recommendations. Unit temperature control shall include wall mounted adjustable thermostat, blower on-off-auto switch and heating-cooling change over control.

6.6 DUCTWORK

Air shall be distributed from central Air Handling Units (AHUs) to achieve proper airflow throughout the facility by means of air distribution ductwork. Air distribution system shall be comprised of supply and return ductwork, fittings, grilles, registers, and/or diffusers. Ductwork shall be constructed of galvanized steel or aluminum sheets and installed as per SMACNA "HVAC Duct Construction Standards (Metal and Flexible)." Flexible non-metallic duct may be used for final unit/diffuser connection in ceiling plenums. These flexible duct run-outs shall be limited to 3 meters in length.

6.6.1 Duct Insulation

Duct insulation shall be provided for all supply ductwork that is not located in the conditioned space and for return ductwork not located within the conditioned space. All ductwork exterior to the building shall be insulated with a minimum RSI=0.88 (R5).

In general interior ducts shall be exposed to the rooms and will not be insulated. The heat lost or gained from the un-insulated ducts shall be considered as part of the heating or cooling of the conditioned space.

6.6.2 Diffusers, Registers & Grilles

Diffusers, registers and grilles shall be factory fabricated of steel or aluminum and distribute the specified air quantity evenly over the space intended. The devices shall be round, half round, square, rectangular, linear, or with perforated face as determined by the design. Units will be mounted in ceilings, high

sidewalls, or directly to ductwork and shall be sized for the airflow to be delivered with a maximum NC rating of 35. Pressure loss through the diffuser shall be considered in sizing the duct system and the system static pressure calculations.

6.6.3 Branch Take-offs

Air extractors or 45° entry corners shall be provided at all branch duct take-offs. Manual volume control dampers shall be included at the branch duct take-offs and where required to facilitate air balancing and shall be shown on the design drawings.

6.6.4 Wall Penetrations

Building wall penetrations shall be carefully made so as not to deteriorate the structural integrity of the wall system. The Contractor shall consult with the building manufacturer, if possible, to determine the best way to penetrate the wall. If the building manufacturer is not available, a structural engineer shall be consulted. In either case, the recommendations of the engineer shall be strictly adhered to.

6.6.5 Air Filtration

All supply air shall be filtered using manufacturer's standard washable filters mounted inside the unit. In addition, all outdoor air intakes shall be equipped with 50 mm (2 inch) thick washable filters.

6.6.6 Control Wiring and Protection Devices

Control wiring and protection of the air conditioning units being offered must be the manufacturer's standard, pre-wired, installed in the unit at the factory or as recommended. Thermostats shall be located near the unit return, and shall include lockable housing that allows viewing of settings without permitting access. For units serving more than one area, the thermostat shall be located near the return of the space with the highest heat generation.

6.7 VENTILATION AND EXHAUST SYSTEMS

All fans shall be used for building ventilation and pressurization with capacities to be selected for minimum noise level generated. Unit mounted fans either used for supply or exhaust shall be centrifugal forward curved, backward inclined, or airfoil fans with non-overloading characteristics of high efficiency and quiet running design. The fans shall be of the heavy-duty type with durable construction and proved performance in a desert environment. Each exhaust fan shall be provided with motorized or gravity dampers which close automatically when the fan is not running. Also, each fan shall be complete with vibration isolator, external lubricators, and all accessories and sound attenuators as necessary.

Supply intake openings shall be provided with motorized dampers which are interlocked with the exhaust fan. The dampers open or close when the exhaust fan is on or off respectively.

Toilet and Wash Area: Minimum exhaust ventilation shall be the largest of 35 m³/h / m² floor or 85 m³/h / toilet (WC). At extreme cold in winter these values can be reduced for short periods to 10 m³/h / m² or 40 m³/h / toilet (WC) to conserve heat. This will require installing a two speed exhaust fan.

6.7.1 Kitchen Hood Exhaust and Make-up Air

As required and as per Kitchen design specialist and equipment supplier requirements. Exhaust flow rate shall be a minimum of 400 cfm per linear foot of hood length. The air velocity in the exhaust duct shall be limited to 1500 feet per minute. The designer shall take special note that multiple large propane stoves will be installed in the kitchen. The steam generated by the local style of cooking with large pots is immense in comparison to western standards, and the additional need for ventilation must be accounted for in the design. Also, the cooks are accustomed to standing on top of the stoves in order to stir the large cauldrons of food. This common cooking practice should be taken into consideration when designing the

exhaust hood. The height of the hood above the stovetop should be such that a man of average stature could stand upright without risk of hitting his head on the hood. Design per NFPA 92A, 96, 204, and 211. Make up air intake shall be of the compensating type (integral with the hood system) or be located as close to the exhaust intake to prevent cold drafts. Non-integral makeup air shall be tempered within ten degrees of ambient air temperature.

To reduce sand and dirt migration, outside air intakes shall be located as high as possible within architectural constraints. The intakes shall be sized so that free air velocities are below 2.5 m/s (500 fpm). For inhabited buildings locate all air intakes at least 1.5 (center-line of intake) meters above the ground. Each air intake shall be provided with a motorized damper which is interlocked with the exhaust fan.

6.8. Submittals

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; drawings indicating location and installation details.

6.9 ELECTRIC HEATERS

6.9.1 Unit Heater

Electric resistance heaters shall be installed in small spaces where only heating is required. Provide a self-contained electric heating unit, suspended from ceiling or structure, with fan and heating elements. Provide control-circuit terminals and single source of power supply with disconnect. Heating wire element shall be nickel chromium. Include limit controls for overheat protection of heaters. Provide tamper resistant integral thermostat.

6.9.2 Cabinet Heater

Cabinet heaters shall be installed in small spaces where only heating is required. Provide a self-contained electric heating unit, recessed mounted in wall or structure, with fan and heating elements. Provide control-circuit terminals and single source of power supply with disconnect. Heating wire element shall be nickel chromium. Include limit controls for overheat protection of heaters. Provide tamper resistant integral thermostat.

6.9.3 Submittals

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; manufacturer's certificate stating that each unit will perform to the conditions stated, catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; complete shop drawings indicating location and installation details.

The manufacturer shall also submit a 2 year warranty for each of the units.

6.10 TEST ON COMPLETION

6.10.1 After completion of the work, the Contractor shall demonstrate to the Contracting Officer that the installation is adjusted and regulated correctly to fulfill the function for which it has been designed. The Contractor shall test, adjust, balance and regulate the section or sections of concern as necessary until the required conditions are obtained. Operational test shall be conducted once during the winter and

once during the summer. Coordinate with the Contracting Officer on when the test shall be scheduled. Include tests for all interlocks, safety cutouts and other protective device to ensure correct functioning. All such tests shall be carried out and full records of the values obtained shall be prepared along with the final settings and submitted to the Contracting Officer in writing.

6.10.2 The following tests and readings shall be made by the Contractor in the presence of the Contracting Officer and all results shall be recorded and submitted in a tabulated form.

- a. Ambient DB and WB temperatures
- b. Room Inside Conditions:
 - 1. Inside room DB & WB temperatures
 - 2. Air flow supply, return and/or exhaust
 - 3. Plot all temperatures on psychrometric chart
- c. Air Handling Equipment: Air quantities shall be obtained by anemometer readings and all necessary adjustments shall be made to obtain the specified quantities of air indicated at each inlet and outlet. Following readings shall be made:
 - 1. Supply, return and outside air CMH (CFM) supplied by each air conditioning system.
 - 2. Total CMH (CFM) exhausted by each exhaust fan
 - 3. Motor speed, fan speed and input ampere reading for each fan
 - 4. Supply, return and outside air temperature for each air-conditioning system.
- d. Electric Motors:
 - For each motor: (1) Speed in RPM
 - (2) Amperes for each phase
 - (3) Power input in KW

6.11 ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

- (a) Note that electrical requirements for all HVAC systems shall be designed and installed to operate on the secondary power standard required herein. The existing power distribution system may require modifications or upgrades to support the additional power required by the HVAC unit. The Contractor is responsible to field verify all the conditions and provide complete shop drawings showing any incidental power upgrades. All electrical work shall comply with the National Electric Code.
- (b) All thermostats shall be wall mounted near the return grilles in the room with the highest heat load generation and mounted 1.5 meters (5 feet) above the floor. In lieu of a thermostat, a temperature sensor may be located in the same location or in the return duct and connected to a thermostat located near the unit return. Thermostat shall be mounted 1.5 meters (5 feet) above the finished floor and be easily accessible. Thermostats for the latrine facilities shall be located near the unit return and mounted 1.5 meters (5 feet) above the finished floor. Operation of the control system shall be at the manufacturer's standard voltage for the unit.
- (c) The following are the minimum requirements for motors regarding enclosure, insulation and protection:
 - 1. Compressor Hermetic: Provide inherent (internal) overload protection.
 - 2. Condenser: Provide internal thermal overload protection.
 - 3. Evaporator (Open Class "A") fan motor type provides internal thermal overload protection.

6.12 CEILING FANS (Only if Required)

6.12.1 Ceiling Fan

Provide 1320mm blade ceiling fans at one per 40 square meters of floor space. Fans shall have

reversible motors. Center or distribute evenly in room. Coordinate placement with the lighting plan to prevent conflict or casting shadows. Fan mount shall be flush, standard, or angle mount depending on ceiling height. Fan shall be mounted such that the fan blade is approximately 2.44 meters above the finished floor. The fan shall be provided with out light kit. The finish shall be factory painted white. The controls shall be from either a single pole switch or from two 3 way switches to provide on/off operation. The electrical supply shall be 230volts, single phase, and 50 hertz. Install per manufacturers' instructions.

6.12.2 Submittals.

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; drawings indicating location and installation details.

6.12.3 Submittals.

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data; drawings indicating location and installation details.

6.13 PROPANE COOKING STOVE

Cooking area shall be provided canopy type exhaust only kitchen hoods and associated exhaust fans. These exhaust hoods shall include baffle type aluminum filters to trap grease/oil. The exhaust fan sizing calculations should recognize the use of propane stoves in the kitchen. Sizing should accommodate all propane burning stoves running simultaneously. Additionally, the placement of the exhaust hood should allow enough clearance for an average sized male to stand on top of the stove platform unobstructed, for standing on the stove is common local cooking practice. The higher than average placement of the hood will require the extension of the lip of the hood out further than normal, in order to catch the majority of the smoke and adequately vent the area. Propane tank shall be located out the DFAC covered in the fenced storage yard

New propane stoves shall be installed with consideration to ease of cooking operation and daily cleanup. The new propane stoves shall be set into a formed concrete opening such that it can easily be removed for replacement, maintenance and cleaning.

Each propane stove shall be provided with three burners. The propane stoves shall be of commercial quality and be capable of producing the highest BTU heat output with all three burners on. The center burner is low heat, center and middle burner is medium heat and all three burners is high heat. A shut off valve for each burner shall be provided at the face of the propane appliance.

Piping from the propane tanks to the respective propane stoves shall be wrought iron, ASTM B36.10M or steel (black or galvanized), ASTM A53. The steel piping shall terminate in front of the propane stoves with a shut off valve and quick disconnect nipple. A stainless steel flexible hose shall connect from the propane stove to the steel piping. Each end of the flexible hose shall be provided with quick disconnect fittings.

The propane piping shall not be embedded in the concrete floor. Installation of the propane piping in concrete trenches is highly recommended. The piping may be surface mounted provided that it is not susceptible to damage or causes any safety hazards.

Piping passing through the exterior wall shall be provided with pipe sleeves.

6.13.1 Propane Fuel Storage/Distribution

Propane Storage and Distribution shall be provided to support operation of the propane stoves for cooking and boiling tea. The bulk storage of fuels shall consist of above-ground horizontal steel tanks sized to store a 30-day supply of fuel. These tanks shall be complete with fill fittings, tank gauge, vent, and other fittings and appurtenances required for full and safe operation. Tanks shall be provided with support saddles, platform/stair and concrete pad. Bulk storage capacity shall be based on minimum four-week full load operation of the kitchen. Metal fuel tank saddles should not be placed directly on fuel containment area slabs. They should be elevated on piers to avoid moisture corrosion. Propane storage tanks shall be provided and installed in accordance with NFPA 58. The propane storage tanks shall be installed on a concrete pad, and provided within an enclosure to protect the tanks from the elements. The Contractor shall coordinate with the User and the Contracting officer in determining the capacity of propane fuel required. The propane fuel capacity shall be based on frequency of cooking, consumption of fuel every cooking cycle, frequency and availability of replacement fuel tanks and spare capacity. This project will require that the Contractor provide the agreed to amount of fuel tanks filled with propane fuel at time of completion.

Provide chain link fence and gates around entire propane storage facility. Fence shall match perimeter Force protection fence with lockable gates, and concertina wire etc. Provide fuel filling system for unloading fuel from fuel tanker into individual bulk storage tanks comprising of truck pad(s), duplex fuel transfer pumps, piping manifold and valves as required for a complete system.

6.14 OPERATIONS AND MAINTENANCE (O&M) FOR MECHANICAL

- (a) Contractor is required to provide a 12 month supply of parts for operation and maintenance of equipment according to the manufacturer's recommendations. In addition to this, the contractors shall provide an inventory of all items, location/address stored and secured, and commissioning plans.
- (b) The O&M manuals must be provided prior to any training activities. Manuals shall be "tri-lingual" in Dari, Pashto and English.
- (c) All control panels shall have tri-lingual name plates in Dari, Pashto and English.
- (d) The contractor shall provide an outline of the training lesson plan (to be approved by the Government) prior to conducting training. CD recordings of training on video shall also be provided, after training is conducted.

7.0 PLUMBING

7.1 SCOPE OF WORK.

7.1.1 General

The Contractor shall design and build domestic cold and hot water systems, waste, drain and vent systems, waste-oil collection and storage and fuel-oil storage and distribution systems required in the facilities identified in Section 1010 Scope of Work and as described herein. The Contractor shall also be responsible for complete design and construction of all domestic and special plumbing systems required for full and safe operations in the Generator Plant, Water Storage and other facility or structures required in this contract.

The work covered in this scope also includes the delivery to site, erection, setting to work, adjusting, testing and balancing and handing over in full operating condition all of the plumbing equipment and associated plumbing works.

7.1.2 Sub-Contractors Qualifications

The plumbing systems shall be executed by a plumbing specialist subcontractor experienced in the design and construction of these types of systems.

7.1.3 Standard Products

All materials and equipment shall be standard product of a manufacturer regularly engaged in the manufacture of the product and shall duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening.

7.2 CODES, STANDARDS AND REGULATIONS

The design and installation of equipment, materials and work covered under the plumbing services shall conform to the following standards, codes and regulations where applicable except where otherwise indicated under particular clause(s). The publications to be taken into consideration shall be those of the most recent editions. Standards other than those mentioned herein may be accepted provided that the standards chosen are internationally recognized and meet the minimum requirements of the specified standards. The Contractor shall submit proof of equivalency if requested by the Contracting Officer.

IPC – International Plumbing Code

NFPA - National Fire Protection Association

ASHRAE – American Society of Heating, Refrigeration and Air-Conditioning Engineers

ASME – American Society of Mechanical Engineers

ASTM – American Society for Testing and Materials

AWS – American Welding Society

7.3 PLUMBING SYSTEMS REQUIREMENTS

7.3.1 Water

Domestic cold and hot water shall be provided in the facilities to serve the water usage and plumbing fixtures provided for the facility. Water service to each facility shall enter the building in a mechanical, toilet, storage, or similar type space. The building service line shall be provided with a shut off valve installed either outside in a valve pit or inside the mechanical room or similar spaces. Water piping shall not be installed in or under the concrete foundation. All water piping shall be routed parallel to the building lines and concealed in all finished areas. Insulation shall be provided where required to control sweating of pipes or to provide protection from freezing.

7.3.2 Piping Materials

Domestic water shall be distributed by means of standard weight (schedule 40) galvanized steel pipe, Polyethylene (PE) plastic pipe (schedule 40 or 80). Waste and vent piping can be made of either galvanized steel pipe (schedule 40), or Polyvinyl Vinyl Chloride (PVC) conforming to ASTM D 2665. Corrosion protection shall be provided if galvanized piping comes in contact with earth or masonry floors, walls or ceilings.

7.3.3 Plumbing Fixtures

The following typical plumbing fixtures shall be provided:

- a. Eastern Water Closet with flush tank assembly. Provide acid resisting fired porcelain enameled cast iron water closet complete with rotating No-Hub 'P' trap and No-Hub coupling to meet piping requirements. Eastern Style water closet shall be furnished with integral non-skid foot pads and bowl wash down non-splashing flushing rim. The water closet shall be completely self supporting requiring no external mounting hardware and shall be flush with floor. The Eastern Style water closet shall incorporate waterproofing membrane flashing flange. Provide a cold water spigot 300mm above finished floor on the right (from a perspective of standing inside of the cubicle and looking out) sidewall of the cubicle. Spigot shall have a flexible hose and spray nozzle such that the occupant can wash over the water closet. Toilets shall be oriented north and south. Toilets shall not face east or west.

Western style toilets shall be provided as shown on the plans.

- b. Lavatories. All sinks shall be trough type constructed of block and concrete with ceramic tile exterior and lining capable of withstanding abuse. Provide maintenance access to waste piping and P-traps from under the sink. Lavatories inside the prison cells shall be tamper-proof with integral spout, soap depression, and outlet connection to slip 40mm OD tubing.

Lavatories. Enameled cast iron, wall or counter mounted. Brass fittings provided for water supplies. (To be used in American or Afghan/American mixed facilities only.)

- c. Sink Faucets. LN faucets shall be stainless steel prison grade with individual knobs for hot and cold. No goose neck faucet fixtures shall be used.
- d. Janitor's Sink. Floor mount janitor, enameled cast iron with copper alloy rim guard. Provide hot and cold water valves with manual mixing. Faucet handles shall be copper alloy. Include a stainless steel shelf and three mop holders.
- e. Shower. Showerhead and faucet handles shall be stainless steel prison grade for LN facilities and regular stainless steel for coalition facilities. Provide for manual mixing with hot and cold water valves. In addition to a shower head, provide each shower stall with a threaded faucet approximately 1.2 m AFF with hot and cold-water controls, mixing valve and a diverter type valve so water can be directed to either the shower or to the lower faucet. Shower shall be provided with low flow shower head. The shower head shall be heavy duty type and securely fastened to the wall.
- f. Emergency Shower and Eye Wash Assembly: not used this contract
- g. Service Sink. Standard trap type, enameled cast iron. Service sinks provided in maintenance areas shall be metallic, and in battery rooms acid resistant.
- h. Kitchen Sink. Single bowl shall be corrosion resisting formed steel. Faucet bodies and spout shall be cast or wrought copper alloy. Handles, drain assembly, and stopper shall be corrosion resisting steel or copper alloy.
- i. Ablution Trench. Not used this contract.
- j. Grease Interceptor. Shall be steel construction manual cleaning type with removable checker-plate cover complete with flow control valve. Tested and rated in accordance with PDI G-101. Concrete shall have a minimum compressive strength of 21 MPa (3045 psi) in 28 days (kitchen use only).
- k. Floor Sink (P-13). Provide floor sink, circular or square, with 300mm overall width or diameter and 250mm nominal overall depth. They shall have acid resistant enamel interior with cast iron body, aluminum sediment bucket and perforated grate of cast iron. Outlet size as indicated on plans.

- l. Floor or Shower Drain: Cast iron construction with galvanized body, integral seepage pan, and adjustable perforated or slotted chromium plated bronze, nickel-bronze, or nickel brass strainer consisting of a grate and threaded collar. Toilet room floor drains are similar except are provided with built-in, solid, hinged grate.
- m. Trench Drains: Floor trench shall be concrete construction with a cast iron grate. The cast iron grate shall be sectionalized and hinged so that it can easily be opened to clean out the trench. The floor trench shall be provided with perforated aluminum pan inserts which can be removed to clean out large food particles. The floor trench drain shall be adjustable perforated or slotted chromium plated bronze, nickel-bronze, or nickel brass strainer consisting of a grate and threaded collar. This style of floor trench shall be installed in the kitchen area of the DFACs in response to kitchen cleaning practices of the local national staff.
- n. Room hose bibs and floor drains shall be provided as required. Afghan dining facility kitchen area clean-up hose bib to be supplied with connecting hose on reel including approximately 12 meters of hose. Provide clean-up spray nozzle with hose assembly.
- o. Drinking Water Fountain: not used this contract
- p. Provide P-Traps per International Plumbing Code IPC for all fixture drains, floor and trench drains, and shower drains. P-traps shall have minimum of 50 mm water seal.
- q. Large Pot sink, provide clean-up spray nozzle with hose assembly.

7.3.4 Hot Water

Hot water shall be provided for the facility to supply 49°C (120°F) hot water to fixtures and outlets requiring hot water. Hot water of a higher temperature shall be provided only where required for special use or process. Hot water piping shall be routed parallel to the building lines and concealed within finished rooms. All hot water piping shall be insulated. A hot water re-circulating pump shall be provided if hot water piping run exceeds 30m.

7.3.5 Hot Water Heaters

The hot water shall be generated by electric water. The unit(s) shall be typically located inside a mechanical room, storage room, toilet/janitor room or similar type space. The unit(s) shall be of the commercially available tank type having low or medium watt density electric heating elements. In cases where the pressure of the water coming into the tank will violate manufacturer recommendations, a pressure reducer shall be installed in the line before the water heater. Also, all water heaters shall be equipped with a blow-off valve that will empty into a nearby floor drain or to the exterior of the building.

7.4 WASTE, DRAIN AND VENT SYSTEM

Floor drains shall be provided in each room that contains a water source. Floor drains shall be provided in the mechanical equipment and toilet rooms as required. Floor drains shall be provided next to the electric water heaters. In mechanical rooms, floor drains shall be provided to avoid running drain piping long distances above or over the floor. A trench drain shall be provided for the DFAC Kitchen. All waste and vent piping shall be provided in accordance with the latest edition of IPC. Drain outlet shall use p-trap system to trap sewer gases. P-trap drain should be a one-piece system without removable parts. Every trap and trapped fixture shall be vented in accordance with the IPC.

7.5 SPECIAL PLUMBING SYSTEMS

Contractor shall design and construct compressor air storage and distribution, waste-oil collection and

storage, fuel-oil storage and distribution other plumbing systems that are required for full performance of equipment and operations and for maintenance in the Power Plant. These systems shall be designed and built in accordance with codes and publications referenced herein before and in compliance with equipment manufacturer recommendations.

7.5.1 Compressed Air Systems

Compressed air shall be provided using a packaged air-cooled electric motor driven compressor and ASME rated receiver with air cooler and moisture separator to remove moisture and oil. Compressed air system shall be capable of operation up to 200 psig maximum for 125 psig normal units. High-pressure system (above 200 psig) shall be provided to supply compressed air to equipment where required. Provide an engine driven air compressor where needed for operation during electrical power outages. The air distribution system shall be provided with necessary regulator valves to maintain desired pressure. Where required, line filters, lubricators, and/or hose reels shall be provided. Compressed air piping shall be black steel pipe and painted to match wall color. Noise level of air compressor should not exceed acceptable db limits.

7.5.2 Waste/Hazardous Drainage – not used this contract

7.5.3 Drainage from Maintenance Areas – not used this contract

7.5.4 Generator Fuel Storage/Distribution

Fuel Oil Storage and Distribution shall be provided to support operation of diesel engine generators at the Power Plant, emergency generators and other locations. The bulk storage of fuels shall consist of above-ground horizontal steel tanks sized to store a 28-day supply of fuel, with containment dikes. These tanks shall be complete with fill tube and cap, suction tube, tank gauge, vent, and other fittings and appurtenances required for full and safe operation. Tanks shall be provided with support saddles, platform/stair and concrete pad. Fuel shall be transferred from the bulk storage tanks by duplex transfer pumps into individual day tanks. Fuel piping shall be fiberglass for underground and steel for piping located above grade. Bulk storage capacity shall be based on minimum four-week full load operation of the plant. Metal fuel tank saddles should not be placed directly on fuel containment area slabs. They should be elevated on piers to avoid moisture corrosion. Fuel containment area should have a sump or manually controlled water release valves for water removal.

7.5.4.1 Filling System

Provide fuel filling system for unloading fuel from fuel tanker into individual bulk storage tanks comprising of truck pad(s), duplex fuel transfer pumps, piping manifold and valves. The system shall provide remote fuel level monitoring panels at the pad(s).

7.5.5 Motor Pool Fuel Point (Storage/Dispensing) – not used this contract

7.6 TESTING AND COMMISSIONING

The Contractor shall test all piping systems in accordance with IPC International Plumbing Code. The final test shall include a smoke test for drainage and vent system and pressure test for the domestic water piping. After completing the work, the Contractor shall demonstrate that all plumbing systems operate to fully satisfy the function for which these systems have been designed. The Contractor shall test, adjust, balance and regulate the system and its controls as necessary until the required designed conditions are met. The Contractor shall include tests for interlocks, safety cutouts and other protective devices to demonstrate safe operation. All such tests shall be carried out in the presence of the Contracting Officer and full written records of the test data and final settings shall be submitted to the Contracting Officer. After all tests are complete, the entire domestic hot and cold water distribution system shall be disinfected. The system shall not be accepted until satisfactory bacteriological results have been

obtained.

7.7 OPERATIONS AND MAINTENANCE (O&M) FOR MECHANICAL

8.0 FIRE PROTECTION

8.1 GENERAL

Facility construction and fire protection systems shall be installed in accordance with the publications listed herein and the publications referenced therein. Where a conflict occurs among various criteria, the more stringent requirement shall take precedence.

8.2 BUILDING CONSTRUCTION

Building construction shall conform to fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements of the building code.

8.3 LIFE SAFETY

Facilities features will be provided in accordance with NFPA 101, 2003 edition among other references, to assure protection of occupants from fire or similar emergencies. The following occupancies are to be considered for this project: non-ambulatory healthcare, business and assembly. Special care per the NFPA 101 code requirement is noted for the separation of these diverse occupancies. See the attached Life Safety check list in Appendix A.

8.4 FIRE PROTECTION EQUIPMENT

All fire protection equipment shall be listed by Underwriters' Laboratories (UL) or approved by Factory Mutual (FM) or equivalent and shall be listed in the current UL Fire Protection Equipment Directory or Factory Mutual Approval Guide or equivalent.

8.5 FIRE DETECTION AND ALARM SYSTEM

Smoke detection – see electrical section for more fire alarm and detection details. Smoke detectors are required for each building. Smoke detectors shall have back up battery power and be installed according to all applicable fire protection codes. Fire detection and alarm systems shall be provided as required by NFPA 101 and UFC 3-600-01 and listed herein. Required fire detection and alarm systems shall be designed and installed in accordance with NFPA 72. A Fire Alarm Control Panel (FACP) is required and shall be connected to the FACP in the existing main hospital. The FACP for the new addition shall be located in an entrance corridor in a conspicuous area. The fire alarm system shall be class B per the NFPA 72 standard.

8.6 WATER SUPPLY FOR FIRE PROTECTION

Fire sprinkler system is required. The existing water supply source is to be used for the water supply for the sprinkler system, The facility is considered a low hazard occupancy and design per the NFPA 13 requirements.

8.7 PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers shall be provided inside all facilities and at exterior locations as required in accordance with NFPA 10. Generally, extinguishers will be of the multi-purpose dry chemical type except for occupancies requiring a special type extinguisher (e.g., carbon dioxide portable fire extinguishers for

electrical rooms).

9.0 ELECTRICAL

9.1 GENERAL

Contractor shall design and construct all electrical systems for the facilities to be provided. This includes design, construction, all necessary labor, equipment, and material for a fully functional system.

9.2 DESIGN CRITERIA

9.2.1 Applicable Standards

- a. Design shall be in the required units as stipulated herein.
- b. Conflicts between criteria and/or local standards shall be brought to the attention of the Contracting Officer for resolution. In such instances, all available information shall be furnished to the Contracting Officer for approval.
- c. All electrical systems and equipment shall be installed in accordance with the requirements set forth in the documents referenced herein.
- d. Acceptance Testing: Contractor shall develop and submit for approval complete acceptance test procedures on all systems provided. As a minimum the testing procedures shall comply with the requirements of the National Fire Protection Association (NFPA) and the International Electrical Testing Association Inc. (NETA).

9.3 MATERIAL

9.3.1 General

Unless noted otherwise, all material used shall be in compliance with the requirements of UL standards. In the event that UL compliant materials are not available, Contractor may then select applicable British Standards (BS), IEC, CE, CSA, GS, DIN listed material (or equivalent), but the contractor must prove equivalence and must provide the government with a full copy of the relevant specification(s)/standard(s). Material and equipment installed under this contract shall be for the appropriate application and installed in accordance with manufacturers recommendations.

Equipment enclosure types shall be in compliance with the National Electrical Manufacturer's Association (NEMA) or the International Electro-Technical Committee (IEC) standards.

Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a non-corrosive and non-heat sensitive plate, securely attached to the equipment. All equipment delivered and placed in storage, prior to installation, shall be protected from the weather, humidity and temperature variation, dirt and dust, and any other contaminants. All equipment shall be in new condition, undamaged and unused.

9.3.2 Standard Product

All material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening.

9.3.3 Design Conditions

All equipment shall be rated and designed for the maximum ambient temperature and altitude of the construction site. Equipment that is altitude and temperature sensitive, such as generators, shall be

derated according to the manufacturer's recommendations. Generic derating criteria for altitude and for ambient temperature may be used to approximate the required size of such equipment during the design phase, but a stipulation shall be placed on the construction plans to adjust the size according to the derating criteria specific to the manufacturer's equipment chosen before the equipment is ordered.

9.3.4 Restrictions

Aluminum conductors shall not be specified or used except as bare steel reinforced (ACSR) overhead conductors in an aerial primary distribution system. Aluminum windings shall not be used in transformers.

9.4 DESIGN REQUIREMENTS

9.4.1 Electrical Distribution System

The existing hospital is supplied from two different power sources. Both power sources terminate at a manual selection switch that is connected to the sole 1000 kVA transformer supplying the building. There are two backup 100 kVA generators to supply power to the emergency bus in the event of a power outage. The reconfigured system, to provide a double ended substation, shall utilize the existing transformer and provide another 1000 kVA transformer. The medium voltage switchgear shall be located near the transformers and the low voltage switchgear shall be located in the existing hospital electrical room if possible. If the low voltage switchgear does not fit into the electrical room, the switchgear shall be located outside near the electrical room. The contractor shall upgrade the equipment in the existing electrical room to supply the existing hospital and the new addition. While work is being done to the electrical room, the contractor shall provide temporary power to the hospital. The work shall be staged in a manner to minimize the time on temporary power. The emergency generators shall be upgraded, if necessary, to provide power to the emergency bus in both the existing hospital and the addition. The existing transformer is loaded to 300 kVA with 700 kVA as spare capacity. The existing system configuration is shown in Appendix A.

Generator power shall be provided as described in the paragraph **Generator Power System** as a backup source. The contractor shall provide a prime power distribution system to distribute power to the site's facilities and other loads as required. The distribution system shall be underground.

The underground distribution system shall be in direct buried, thick walled, schedule 80 ductbanks with the ducts not less than 1220mm below grade. Manholes and handholes shall be provided at changes of direction of more than 40 degrees and elsewhere as required to limit the pulling tension and sidewall pressure on the cables during installation to acceptable levels as defined by the cable manufacturer. Manholes shall be provided for ductbanks with more than 2 ducts. Handholes shall be provided wherever a manhole is not required by quantity of ducts or by cable manufacturer's installation recommendations. Underground ducts shall be not less than 100mm diameter thin-wall PVC.

The primary distribution system on the installation is 15kV. The padmounted transformers shall be loop feed, dead front type with load break elbows. Each padmounted transformer shall be sized to provide power for the total load of the facility served without being loaded to more than 110% of its rated capacity.

Secondary electrical distribution system shall be 380/220 volt, 3-phase, 4 wire, 50 hertz. Design of the electrical system within facilities shall include, but is not limited to (a) interior secondary power distribution system, (b) lighting and power branch circuit and devices, and (c) fire detection and alarm system. All systems shall be designed for the ultimate demand loads, plus 25% spare capacity.

The contractor shall provide service entrance feeders from the distribution system to the service entrance equipment located inside of each facility and sized to the rating of the service entrance equipment. Service entrance equipment shall include a distribution panelboard sized to supply the total load of each facility. Service entrance feeder lengths shall be kept as short as possible to minimize voltage drop.

They shall be underground not less than 1220mm below grade in direct buried 100mm minimum thick-wall PVC from pad mounted transformers. A spare conduit of equal size shall be provided.

All panelboards shall be circuit breaker 'bolt-on' type panels. Minimum size circuit breaker shall be rated at no less than 20-amperes. Circuit breakers shall be connected to bus bar(s) within the panelboards. Daisy chain (breaker-to-breaker) connection(s) are not acceptable. Indoor distribution panels shall be flush mounted in finished areas and surface mounted in unfinished areas. All circuit breakers shall be labeled with an identification number corresponding to the panel schedule. A 3-pole circuit breaker shall be a single unit and not made up of 3 single pole circuit breakers connected with a wire or bridge to make a 3-pole breaker. All branch circuit wiring shall be copper, minimum #4 mm² (#12 AWG) installed in metal conduit. Wiring shall be concealed in finished areas and surface mounted in unfinished areas. Flush mounted panels shall be provided with spare empty conduits from panel to unfinished area for future use. All panels shall be provided with a minimum of 25% spare capacity for future load growth. Power receptacles (outlets) shall be duplex type 220 V, 50 hertz, type CEE 7/7 with Earth Ground rated for 20A or better and shall be compatible with the required secondary power. All splicing and terminations of wires shall be performed in junction or device boxes. Proper wire nuts/connectors shall be used for splicing wire. No twist-wire connections with electrical tape wrapped around it shall be acceptable. All electrical installation shall be in accordance with NFPA 70 (National Electric Code). For large panels (225 Ampere and above) provide an ammeter, voltmeter and kilowatt-hour meter to monitor energy usage. Selector switches shall be provided for each meter to read all 3 phases. Receptacle locations shall be coordinated with architectural requirements. All GFCI receptacles shall be 10mA.

Contractor shall design and provide circuits for all mechanical equipment and any other equipment that requires power and make the final connections.

All loads shall be coordinated to provide balanced loading. Phase imbalance at each panel shall not exceed 5%.

Voltage Drop for branch circuits shall be limited to no more than 3%; voltage drop for branch and feeder circuits combined shall be limited to no more than 5%.

All circuit breakers shall use down-stream coordination to ensure the breaker nearest a fault or overload is the first to trip.

9.4.1.1 Generator Power System

The backup generator power system shall consist of two generators, either existing or new. The generators shall supply power at the utilization voltage of the facility.

Generators shall be derated as necessary for the ambient temperature and altitude of the site. The generator power system shall be provided with a make-before-break, 4-pole, automatic transfer switch (ATS) rated for the capacity of the system. The ATS shall be capable of automatically and manually transferring the site's distribution system to generator power upon loss of local utility power and transferring back automatically and manually to local utility power upon its restoration.

The ATS shall be equipped with synchronizing/paralleling equipment to allow the generators to share the load of the site. When generator power is required at least one (1) generator shall be online at all times. When the site's load reaches 90% of the online generator's capacity, the standby generator(s) shall start. The generator that synchronizes first shall come online and share the load equally. When the site's load drops below 80% of the online generators' combined capacity, the generator(s) shall drop off line, one at a time, keeping a minimum of one generator operating online.

Whenever a generator starts, it shall go through a cool down cycle prior to shutdown. All relaying shall be automatically reset for automatic restart and stopping of generators as the load increases or decreases. Load sharing by the standby generator(s) shall be adjustable between 50% and 95% of the load on the

online generator(s). Sequence of operation shall be time clock controlled at smaller sites (2 or 3 generators) and shall be PLC controlled at larger sites. A properly sized main switchboard shall be provided to distribute the power produced by the generator(s) to the facilities on the site.

Generator fuel storage capacity shall be based on usage at total load for a minimum of 30 days. Fuel storage shall either be in aboveground single wall steel tank(s) with containment pit or underground double wall with leak detection.

9.4.2 Lighting

Design levels shall be per IES standards as a minimum. For convenience, the following lighting level table is listed. Note: all spaces listed below may not be within the work required within this contract.

Patient Sleeping Rooms	per UFC 4-510-01
Toilets, Showers, Latrines, washrooms	20 FC (200 Lux)
Mechanical/Electrical rooms	30 FC (300 Lux)
Corridors	20 FC (200 Lux)
Offices (private)	50 h/5 v FC (500 h/50 v Lux)
Office areas (open)	30 h/5 v FC (300 h/50 v Lux)
Kitchens (commercial)	70 h/3 v FC (700 h/30 v Lux)
Dining Areas	20 h/3 v FC (200 h/30 h Lux)
Waiting room	50 h/5 v FC (500 h/50 v Lux)
Nurse counter and office	50 h/5 v FC (500 h/50 v Lux)
Conference	30 h/5 v FC (300 h/50 v Lux)
Barber area	50 h/30 v FC (500 h/300 v Lux)
Laundry areas	50 h/30 v FC (500 h/300 v Lux)
Storage rooms	30 h/3 v FC (100 h/30 v Lux)
Egress path (incl. exterior)	10 Lux
Areas adjacent to egress path	0.5 Lux

FC = FootCandle

h = horizontal component

v = vertical component

Indoor lighting for all areas shall consist of fluorescent surface mounted light fixtures. Exterior lighting shall be HID (metal halide or high pressure sodium) as referenced. Moisture resistant/waterproof fluorescent light fixtures shall be provided in high humidity and wet areas such as latrines, showers and outside. Battery powered 'emergency' and 'exit' lights shall be provided within each building, as applicable, for safe egress during a power outage. All light fixtures shall be factory finished, complete and operational, to include but not be limited to, lens, globe, lamp, ballast etc. Industrial type fluorescent light fixtures shall not be used. Every room shall be provided with a minimum of one light switch. Light fixtures shall be mounted approximately 2.5-meters (8 feet) above finished floor (AFF) minimum. Fixtures may be pendant or ceiling mounted, depending on the ceiling type and height.

9.4.3 Light Fixtures

Lighting fixtures shall be a standard manufacturer's product. Fluorescent surface mounted light fixtures shall be power factor corrected and equipped with standard electronic ballast(s), except in medical facilities where magnetic ballast(s) shall be required. All light fixtures shall properly operate using standard lamps available locally. Fixtures shall be fully factory wired and designed for appropriate application i.e. appropriate for that location where installed.

9.4.4 Emergency "EXIT" Light Fixtures

Emergency "EXIT" light fixture shall be provided in accordance with NFPA requirements (note: at all exit

doors and at all intersections in corridors). Fixtures shall be single or double sided as required by the location and for wall/ceiling mounting. Unit shall illuminate continuously and be provided with self-contained nickel cadmium battery pack, to operate on floated-battery or trickle charge circuit. Fixture shall operate satisfactorily for 90 minutes during a power outage. Unit shall have test/re-set button and failure indication lamp. Primary operating voltage shall be 220 volts. Lettering "EXIT" shall be color red and not less than 6 inches (150 mm) in height and on matte white background. Illuminations shall be with LEDs.

9.4.5 Above Mirror Lights

Above mirror lights shall be provided in toilet rooms.

9.4.6 Emergency Lighting

Battery powered emergency lights shall be provided within each building per NFPA for safe egress during power outage. Fixtures shall be provided with self-contained nickel cadmium battery pack to operate on stand-by circuit for 90-minute minimum. Unit shall have test/re-set button and failure indication lamp. Normal operating voltage shall be 220 volts. Emergency lighting fixtures shall be connected to the normal lighting system.

9.4.7 Light Switches

Light switch shall be single pole. Minimum of one light switch shall be provided in every room. Lighting in large rooms/areas may be controlled from multiple switches. Three-way or four-way lighting shall be provided in all rooms / areas with multiple entrances.

9.4.8 Receptacles

General-purpose receptacles shall be as required herein. All receptacles shall be duplex, unless otherwise specified in this section, the NEC, or other referenced standard.

Receptacles shall be placed at a maximum of 3-meter (10 feet) intervals. Areas with computer workstations or similar equipment will have additional receptacles. Sinks will have a receptacle above, with one duplex receptacle serving two sinks that are side-by-side. Receptacles in wet/damp areas or within 1 meter (~3 feet) of sinks, lavatories, or wash-down areas shall be ground fault circuit interrupter (GFCI) type or residual current disconnect (RCD) type, with the trip setting of 10 milliamperes or less. Total number of duplex receptacles shall be limited to six (6) per 20-ampere circuit breaker.

9.4.9 Conductors

All cable and wire conductors shall be copper. Conductor jacket or insulation shall be color coded to satisfy NEC requirements. The use of 75 or 90 degree C (minimum) terminals and insulated conductors is required. Use of higher degree C rated conductors on circuits with protective device terminals rated at a lower degree C is allowed but must be derated to the rating of the device terminals.

9.4.10 Grounding and Bonding

Grounding and bonding shall comply with the requirements of NFPA 70. Underground connections shall be exothermally welded. All exposed non-current carrying metallic parts of electrical equipment in the electrical system shall be grounded. Insulated grounding conductor (separate from the electrical system neutral conductor) shall be installed in all feeder and branch circuit raceways. Grounding conductor shall be green-colored, unless the local authority requires a different color-coded conductor. Ground rods shall be 20 millimeters (0.75 inches) in diameter and 3 meters (~10 feet) long made of copper-clad steel. Final measurement of the ground resistance shall be in compliance with the requirements of the local authority but shall not exceed 25 ohms when measured more than 48 hours after rainfall.

9.4.11 Enclosures

Enclosures for exterior and interior applications shall be NEMA Type 3S (IEC Classification IP54) and NEMA Type 1 (IEC Classification IP10) respectively.

9.4.12 Fire Detection & Alarm System

A complete Fire Detection and Alarm System shall be provided throughout the buildings and installed in accordance with NFPA 72 requirements. System shall include, but not limited to, addressable Fire Alarm Control Panel (FACP), manual pull stations, horns, strobes, and smoke and/or heat detectors (with alarm verification feature). The system shall be capable of automatically transmitting the alarm signal, via telephone lines, to the local fire department/fire station or other location designated by the Contracting Officer. Fire alarm system shall be complete and a standard product of one manufacturer and shall interface with the existing fire detection system. The fire detection system in the addition and the existing hospital shall function as one system.

9.4.13 Transient Voltage Surge Suppression (TVSS)

Transient Voltage Surge Suppression shall be provided utilizing surge arresters to protect sensitive and critical equipment. As a minimum TVSS protection shall be provided at each panel serving electronic loads and shall be shown on the panel schedule. It is recommended that Metal Oxide Varistors (MOV) technology be used for such applications.

9.4.14 Conduit Raceway System

Metal conduit system shall be complete, to include but not limited to, necessary junction and pull boxes. Smallest conduit size shall be no less than 20mm (0.75 inch) in diameter. All empty conduits shall be furnished with pull wire or cord or rope (depending on the size of conduit and length of run). System design and installation shall be per NFPA 70 requirements. Exterior conductors below grade shall be direct buried PVC conduit at a depth of 1220 millimeters.

9.4.15 Cable Tray Raceway System

Cable trays shall be ladder type and provided with, but not limited to, splices, end plates, dropouts and miscellaneous hardware. System shall be complete with manufacturer's minimum standard radius and shall be free of burrs and sharp edges. Nominal width of cable tray shall be 300mm (12 inch) and rung spaced at 150mm (6 inch). Nominal depth shall be 100mm (4 inch). System design and installation shall be per NFPA 70 requirements.

9.4.16 Identification Nameplates

Major electrical equipment, such as transformers, panelboards, and load centers, etc. shall be provided with permanently installed engraved identification nameplates.

9.4.17 Schedules

All panelboards and load centers shall be provided with a directory. Directory shall be typed written in English.

9.4.18 Single Line Diagram

Complete single line diagrams shall be provided for all systems installed. All major items in each system shall be identified and labeled for respective ratings. Single line diagrams for each system, installed in a clear plastic frame, shall be provided.

9.5 OPERATIONS AND MAINTENANCE (O&M) FOR ELECTRICAL

- (a) Contractor is required to provide a 12 month supply of parts for operation and maintenance of equipment according to the manufacturer's recommendations. In addition to this, the contractors shall provide an inventory of all items, location/address stored and secured, and commissioning plans.
- (b) The O&M manuals must be provided prior to any training activities. Manuals shall be "tri-lingual" in Dari, Pashto and English.
- (c) All control panels shall have tri-lingual name plates in Dari, Pashto and English.
- (d) The contractor shall provide an outline of the training lesson plan (to be approved by the Government) prior to conducting training. CD recordings of training on video shall also be provided, after training is conducted.

10.0 COMMUNICATIONS – Telephone and Data Distribution

10.1 GENERAL

The Contractor shall provide a building telephone and data cabling system. The system shall provide cable connection from the existing communications room.. The telephone and data equipment will be provided by others. The incoming communications cabling connection to the building will be provided by others. The Contractor's system shall be fully capable of interface with the future equipment and future connection to the site telephone and data systems.

10.1.1 Telephone/Data Cabling Distribution System for each building.

The Contractor shall provide two telephone/data boxes per workstation. Conference rooms shall have two telephone/data boxes on each interior wall, three interior walls per conference room. Provide two communication boxes in each patient room and one box on each wall in all the offices. The nurses station shall have three boxes installed. Each box shall have dual RJ-45 outlets, one for telephone and one for data. Interior copper cable to each outlet shall be 4 pair, unshielded twisted pair (UTP), Category 5e or better. Each telephone/data junction box shall be fitted with two RJ-45 jacks (1-voice / 1-data). Two runs of Category 5e (UTP) or better data cable shall be installed from each junction box back to the patch panel in the communications room and labeled on both ends with room number and jack number. Contractor shall be responsible for providing one enclosed 480 mm wide, 1 800 mm tall communications equipment rack with top-mounted cooling fans and front & rear closing doors. Contractor shall provide two 480 mm 48-port patch-panel mounted in the rack. Contractor shall coordinate the location of the communications rack (first or second floor) with the Contracting Officer Representative (COR). Termination configuration shall be EIA/TIA T568B. A Corps of Engineers representative shall test each cable run and data jack after it has been installed. Two 103 mm empty conduits shall be provided from the room to the outside for to facilitate future telephone cabling installation into the building. Two additional 103 mm empty conduits shall be provided between the communications rooms of both buildings. Provide all empty conduits with a pull rope. Incoming telephone and data service is to be provided by others. Properly sized metallic conduit and cable tray shall be used as appropriate to distribute the telephone/data cabling throughout the building. Minimum conduit size shall be 20 mm inside diameter. Data/communications face plates shall be surface mounted to the wall.

10.1.2 Cable Television System

A coax cable television signal distribution system shall be provided for each patient room and waiting area. The system equipment such as signal and amplification equipment is to be provided and installed by others. A 50 mm conduit shall be run to each room and then connect to the outside for incoming satellite television station. The incoming cabling and signal is to be provided by others. Television cable shall be RG 6 Coax distributed in conduit. Wall cable outlet connectors shall be F type. All F type connectors shall be approved by the COR. CATV system shall be terminated in the provided rack using approved patch panel.

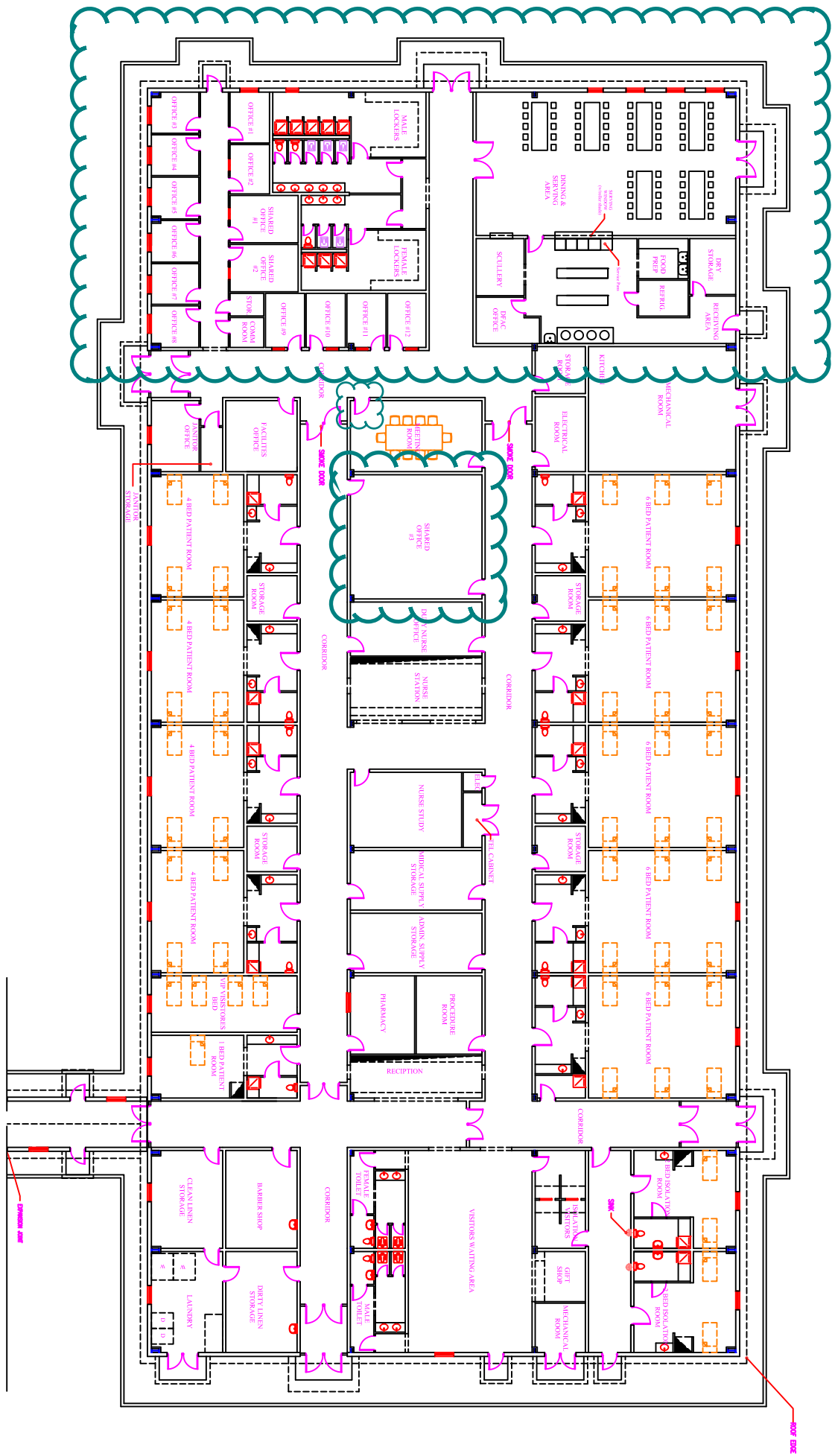
10.1.3 Closed Circuit Television

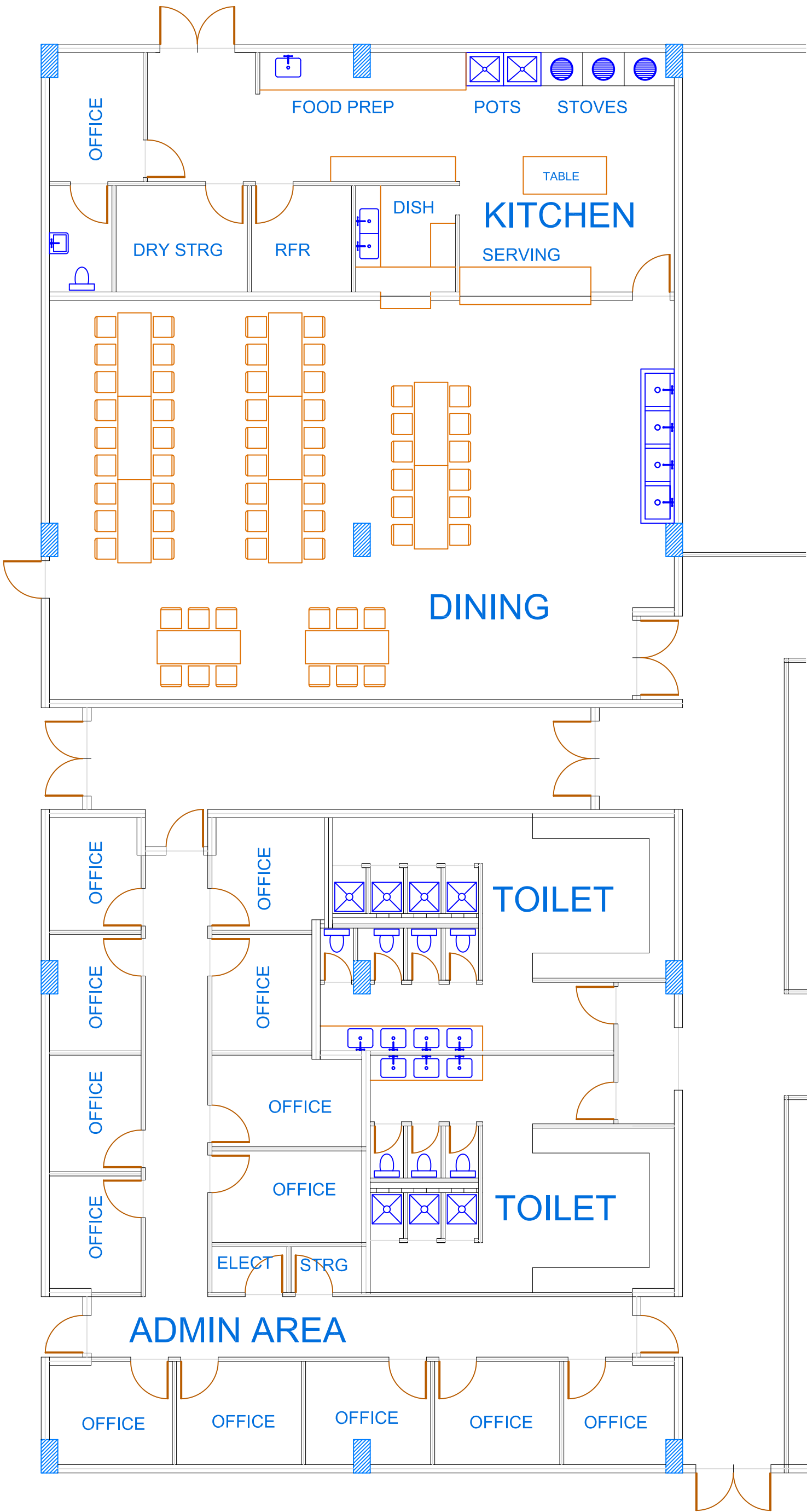
The contractor shall install 50 mm conduit and junction boxes for a closed circuit television system. The system shall be monitored from the nurses station and shall have camera locations such that all the hallways can be monitored.

-END OF SECTION-

(End of Summary of Changes)

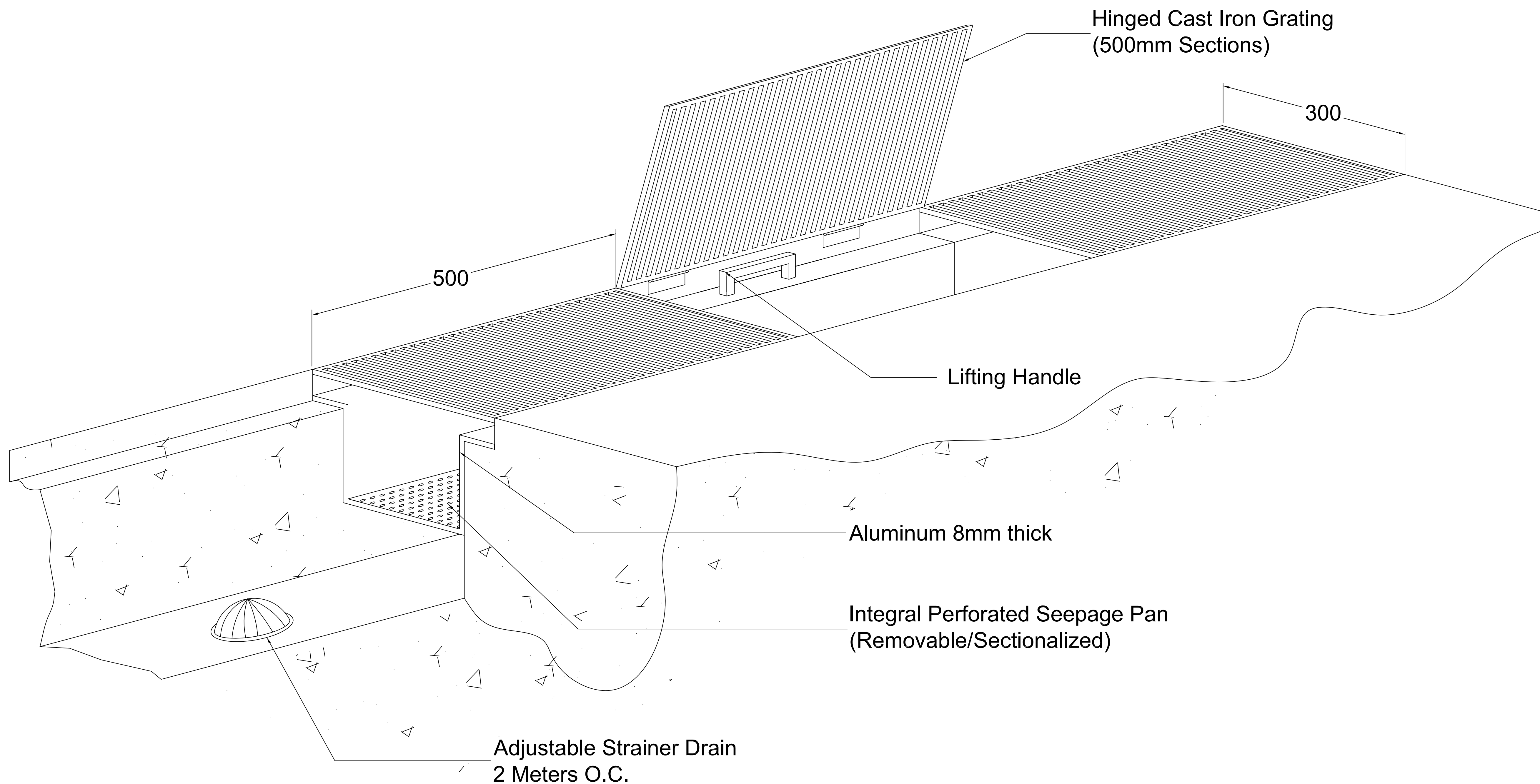
MAZAR-E-SHARIF PROPOSED HOSPITAL ADDITION LAYOUT
(W/DINING FACILITY AND KITCHEN)





HOSPITAL ADDITION PLAN

0 5000 10,000 mm



FLOOR TRENCH DETAIL

TRENCH DRAIN DETAIL

US ARMY CORPS OF ENGINEERS



Project number
Date: 30 JULY 2007

Checked by

Scale

MECH

Camp Shaheen Health Section

